June, 1947

Vol. 36 No. 6

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## INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

*The Shop Teachers' Professional Magazine*

# FREE! TO INDUSTRIAL ARTS TEACHERS

# HOW-TO-DO-IT BOOKS on Aluminum Shop Practices

**FORMING ALCOA ALUMINUM AND MAGNESIUM**
**1947; 56 pages; 20 illustrations**

Explains the fabrication of aluminum and magnesium by blanking and piercing, drawing, spinning, shape forming, embossing, coining and stamping. Discusses the forming characteristics of the various aluminum and magnesium alloys.

**ALCOA ALUMINUM AND ITS ALLOYS**
**1946; 153 pages; 18 illustrations**

Fundamental information concerning the many Alcoa Aluminum Alloys. Data in tabular form on their chemical and physical properties as well as the tolerances and sizes of all commercial forms.

**RIVETING ALCOA ALUMINUM**
**1946; 48 pages; 12 illustrations**

Detailed information on riveting aluminum and its alloys. Covers strength and proportions of riveted joints, driving methods, and selection of rivet alloy. Also, brief account of aircraft riveting.

**MACHINING CHART**
**14 x 20 inches**

Describes proper rake angles for machining aluminum, correct tool material, best cutting speeds and feeds, and types of cutting compounds. Illustrations show types and uses of numerous tools used in machining aluminum.

**FINISHES FOR ALCOA ALUMINUM**
**1946; 59 pages; 55 illustrations**

A handbook which discusses the many kinds of finishes that can be applied to aluminum by mechanical, organic, chemical, electrochemical, and electroplating methods.

**WELDING AND BRAZING ALCOA ALUMINUM**
**1945; 109 pages; 43 illustrations**

Complete information on torch, arc, resistance welding, and brazing of aluminum. Six full-color illustrations of welding flame adjustments.

**CASTING ALCOA ALLOYS**
**1947; 94 pages; 22 illustrations**

General foundry principles, including melting, molding, and finishing. A complete description of the various aluminum casting alloys is listed in convenient form.

**WELDING AND BRAZING CHART**
**10¾ x 13¾ inches**

Contains helpful information for welding and brazing aluminum, including proper flame adjustments for both oxyhydrogen and oxyacetylene. Well illustrated and printed in full color, both sides.

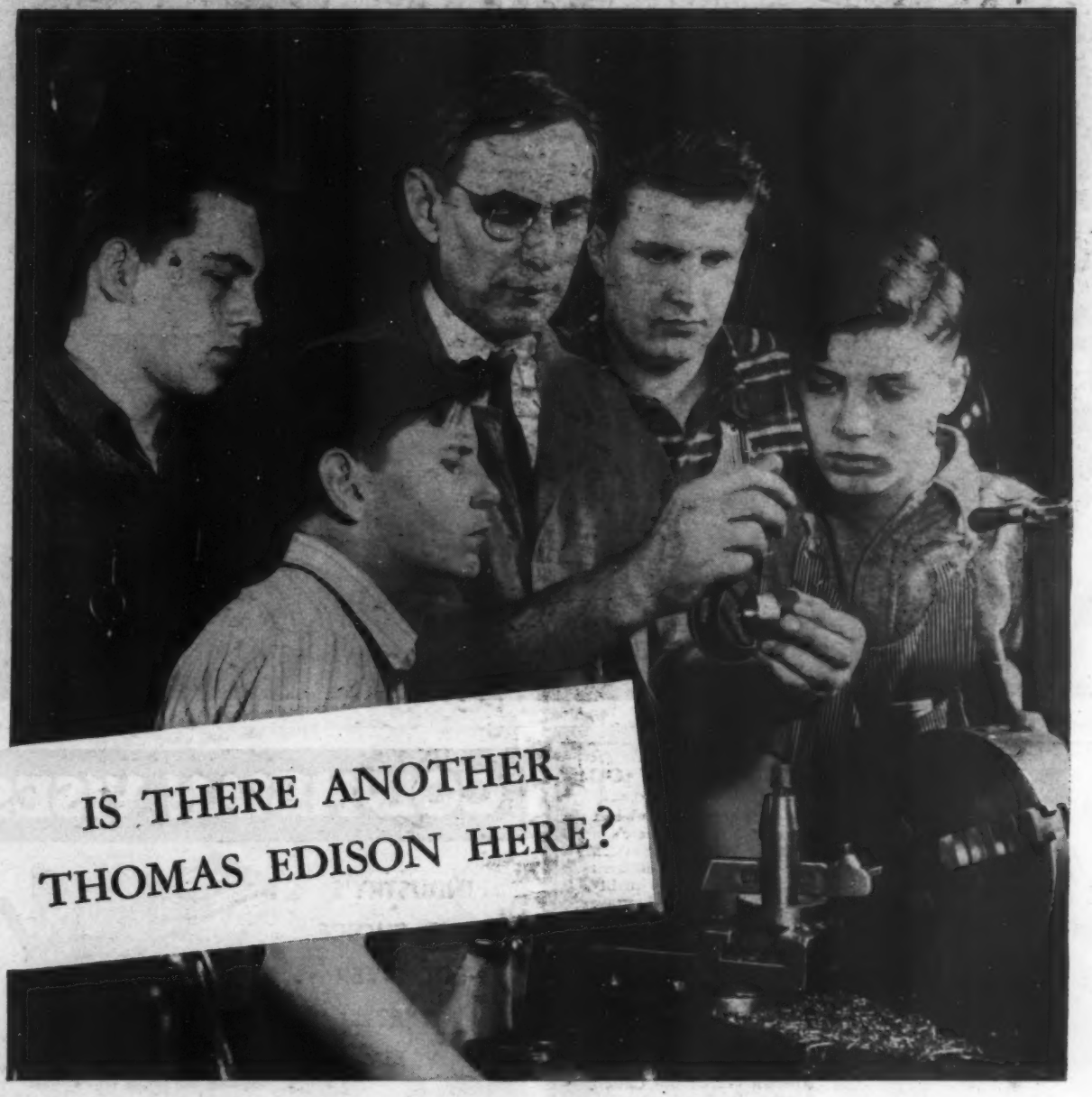
Which of these books and visual aids do you need? They will prove invaluable to any teacher whose students are working with aluminum. Below is additional material, useful for general background information on aluminum. All teaching aids described on this page sent free to industrial arts teachers. Write ALUMINUM COMPANY OF AMERICA, 1773 Gulf Building, Pittsburgh 19, Pennsylvania.

**ALUMINUM—ITS STORY**
Written in nontechnical style for Junior High School students. Tells how aluminum is made, its history and uses. 45 pages, illustrated.

**AN OUTLINE OF ALUMINUM**
General information on the history, chemistry, production, and applications of aluminum. Suitable for teachers and Senior High School students. 64 pages, illustrated.

**CHART ON CHEMISTRY AND HISTORY OF ALUMINUM**
Covers complete story of aluminum from mine to metal. Graphically illustrated with photographs, diagrams, drawings, and raw material samples. 17⅛ x 27⅛ inches.

ALCOA FIRST IN ALUMINUM

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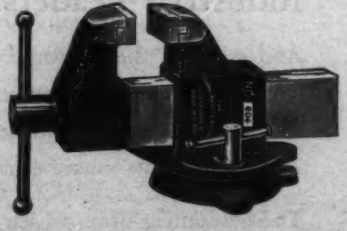

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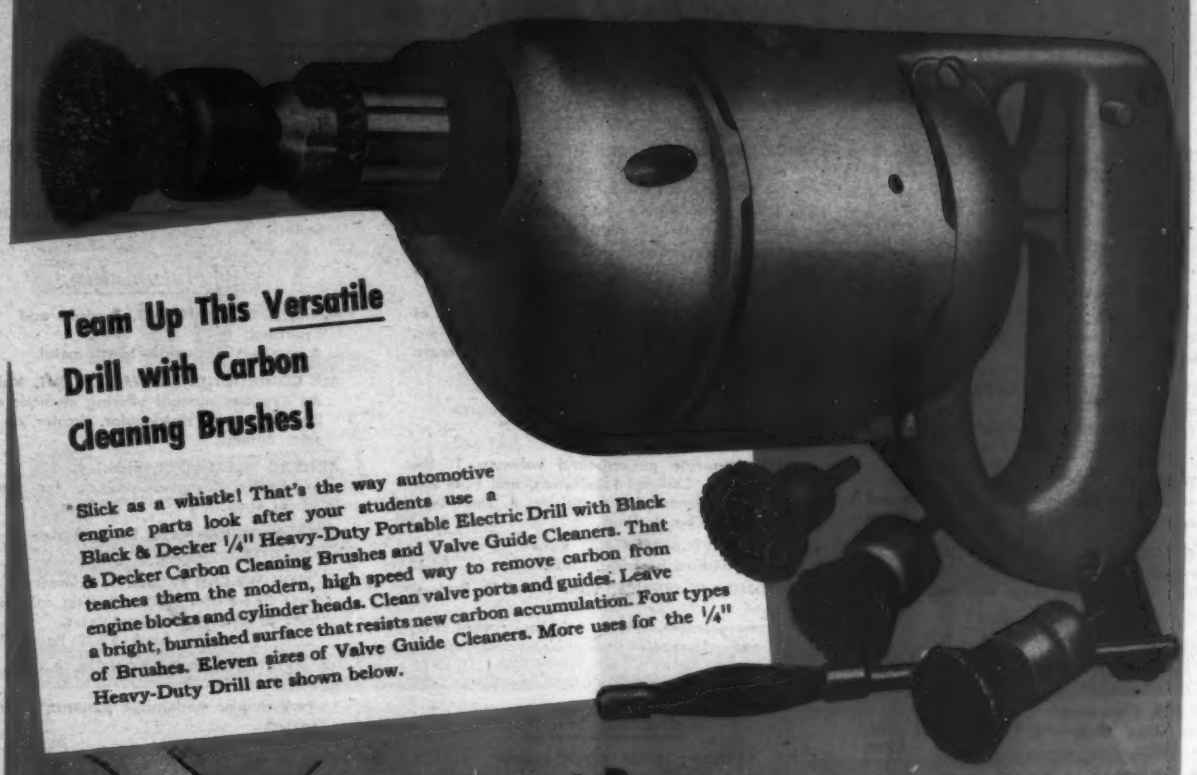

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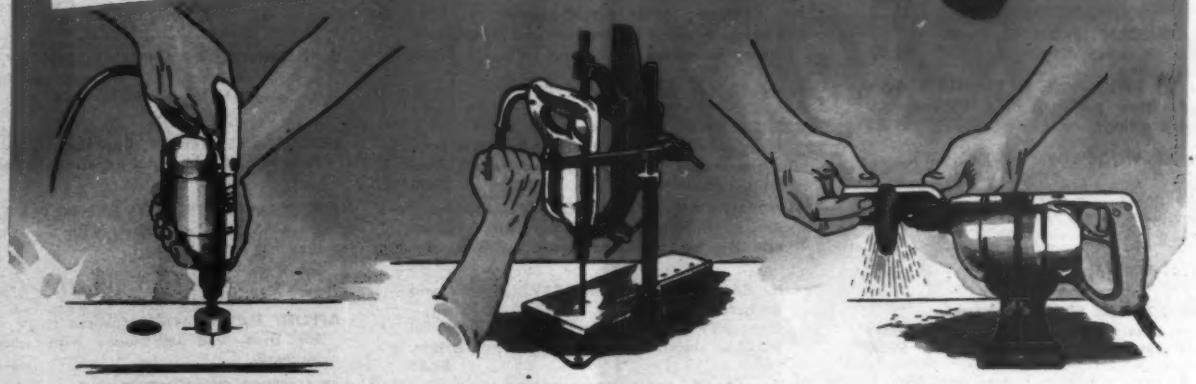

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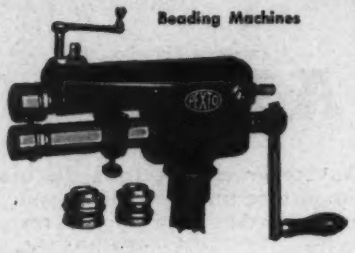

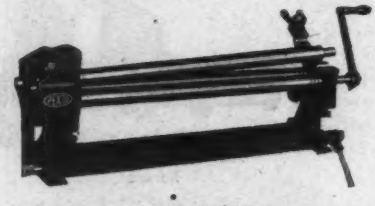

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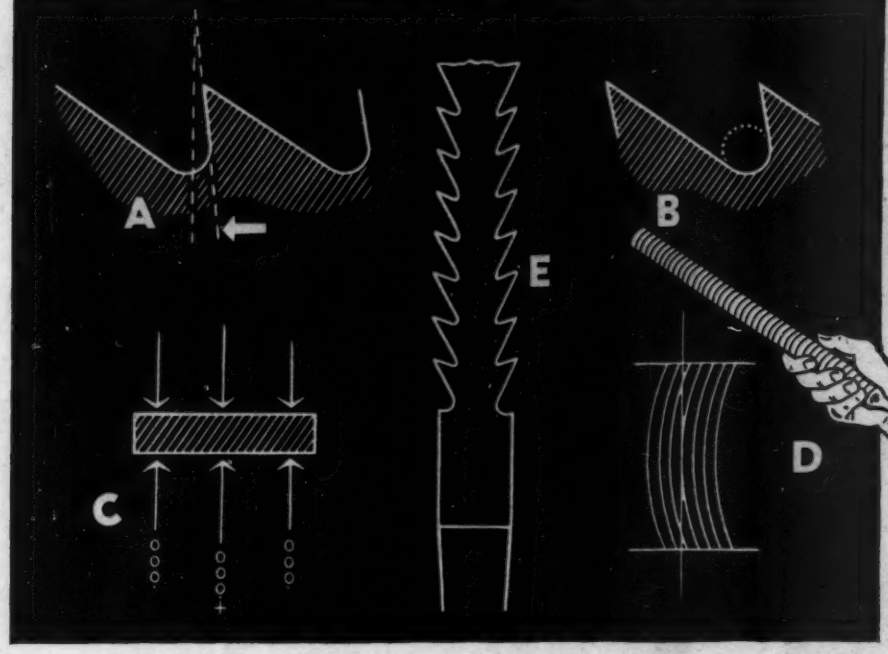

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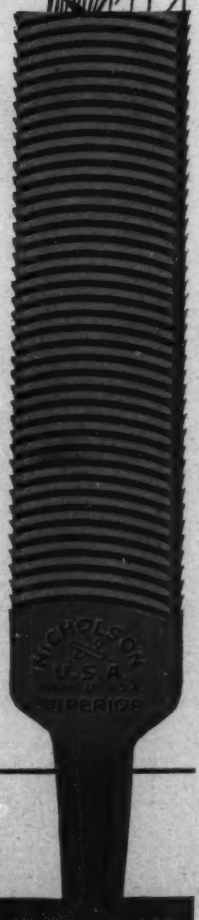


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For safety sake, then, if you change your address, inform our circulation department at once. A postal card is all that is required, and please let us have (1) your new address, (2) your old address, (3) your zone number.

### ▶Summer School Opportunities

**Bradley University, Peoria, Ill.,** June 14 to July 22, and July 22 to August 26. **Cornell University, Ithaca, N. Y.,** July 1 to August 9. **Oregon State College, Portland, Ore.,** June 17 to July 25, and July 26 to August 29. **Oswego State Teachers College, Oswego, N. Y.,** June 30 to August 8, June 30 to July 25, and July 28 to August 22. **Pennsylvania State College, State College, Pa.,** June 30 to August 9. **State Teachers College, Millersville, Pa.,** June 2 to July 12, and July 14 to August 22. **The Stout Institute, Menomonie, Wis.,** June 23 to August 1. **University of Minnesota, Minneapolis, Minn.,** June 17 to July 25, and July 28 to August 29. **Wayne University, Detroit, Mich.,** beginning June 23 for 6, 8, 10, or 12 weeks.

### ▶Coming Conventions

*June 18–19.* National Graphic Arts Education Association at Chicago, Ill. Fred J. Hartman, educational director, 719 Fifteenth St., N.W., Washington 5, D. C. Headquarters, Morrison Hotel at Madison and Clark Sts.

*June 19–20.* Pennsylvania Vocational Association at Eagles Mere, Pa. Secretary, Henry S. Brunner, Dept. of Agricultural Education, State College, State College, Pa. Headquarters, Forest Inn.

### ▶This Month's Cover

Our cover picture this month shows a student of the general metals class in the senior high school at Tucson, Ariz., doing oxweld cutting. The photograph was made by one of the students of the class in photography. — Harry A. Goldstein, instructor.

VOL. 36, NO. 6 JUNE, 1947

# Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

THE BRUCE PUBLISHING COMPANY
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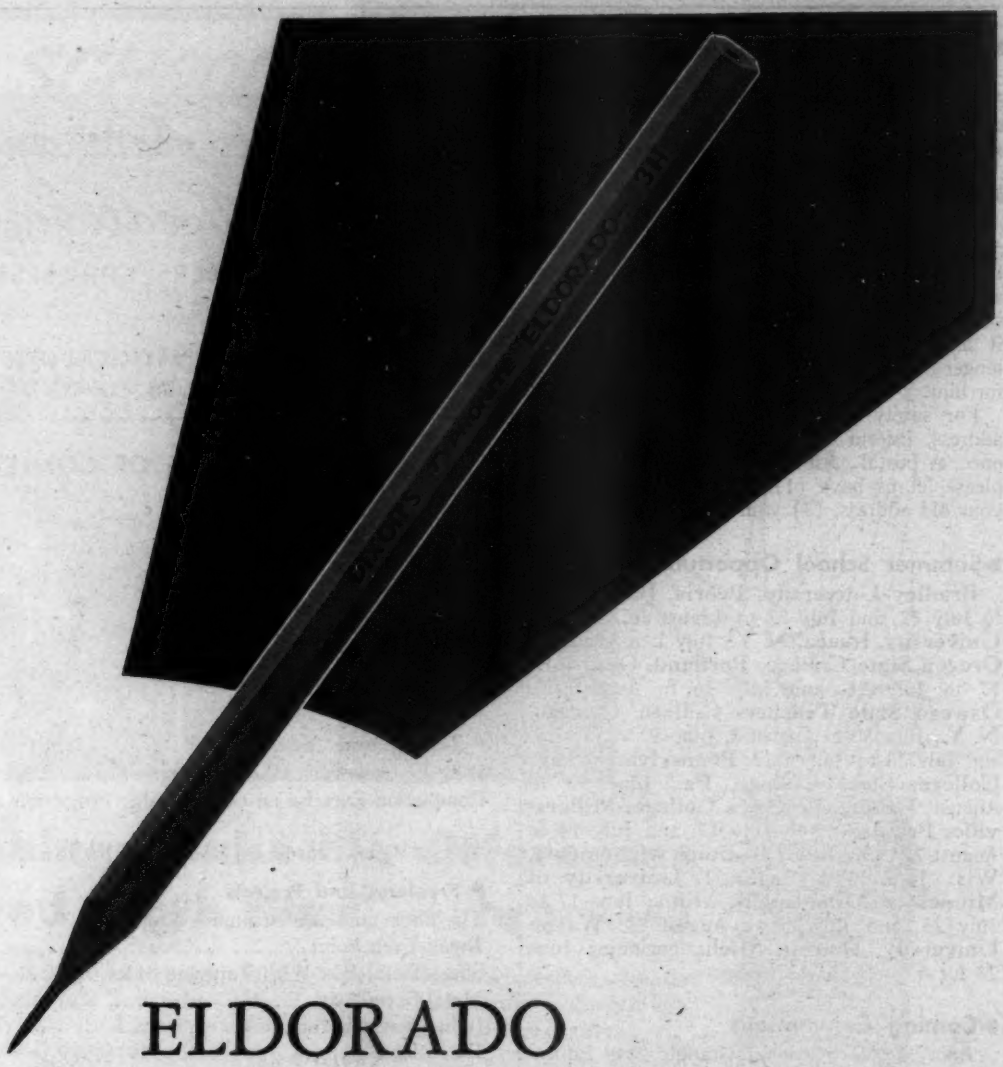
Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879. Copyright, 1947, by the Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930. Published monthly except during July and August.

*Subscription Information.* — Subscription price in the United States, Canada, and countries of the Pan-American Union, $3.00 per year, payable in advance. Postage, foreign countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents.

*Discontinuance.* — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

*Editorial Contributions.* — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

*Articles Indexed.* — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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-IAVE-
JUNE . . . . 1947

# Guidance Program For The Large High School

**CLAUDE M. KEESLING**
Director of Guidance
Shortridge High School
Indianapolis, Ind.

Guidance is an inherent part of every educational program. It is a co-operative enterprise by teachers and administrators to discover and utilize the potentialities of each boy and girl. It provides educational and vocational experiences designed to help each student to reach his or her maximum efficiency in life. It is a cocurricular service, and challenges the intelligence of teachers and specialists. To meet this challenge, our school has selected a staff of teacher-advisers who are interested in individual and group guidance.

### Personnel

A staff of eight class advisers, four men and four women, consists of the director and seven advisers. Two advisers are assigned to each grade level, one for the boys and one for the girls. Advisers are assigned to each entering 9B group and continue as the students' advisers for three years, or until they have earned 23 or more credits and have been certified as members in the senior class. Each adviser is relieved of one class for each one hundred advisees assigned to him. In general, each adviser spends one half of his time counseling and the other half in the classroom.

### Equipment

Two rooms have been divided to provide space for interviewing and for reception. Each adviser has a small office and is provided with a desk, two chairs, and a filing cabinet. At the reception desk, eight student assistants act as hostesses during each period of the day. They help the advisers in filing, recording, typing, making work sheets, answering telephone calls, delivering messages, and the like. Two files of college catalogs are maintained, one in the library and one in the advisers' office. Also, available to the adviser and advisees are guides, books, pamphlets, brochures, and manuals of information on guidance subjects.

### The Interview

Individual conferences are scheduled during regular school hours by class advisers. Each pupil is interviewed at least once each semester. Other interviews are scheduled as occasions demand, or as they are desired by the advisee. Before the interview, the adviser has on his desk the pupil's cumulative record which includes his family history, a record of his school marks, a record of scores made on intelligence and interest tests, his personality ratings, his tentative four-year plan, and his choice of colleges or his postschool plans. During the interview, adjustments are made in the four-year plan as the pupil's interests, abilities, and limitations become apparent. Subjects for the next semester are chosen at this time by the advisee under the supervision of the adviser. Special consideration is given to pupils who have health, work, or transportation problems. Topics discussed include educational and vocational plans, teacher-pupil relationship, pupil-pupil relationship, pupil success or failure, and social problems of the advisee. Potential failures are counseled early each semester. Failing pupils are counseled after each grade period.

### Orientation

A program for all pupils new to the school includes a first-day welcome program, student guides and student information centers, school *mixers* and *newcomer* parties, convocation programs to discuss curriculum information and proper study habits, a *pep* session to teach school songs and yells, periodic conferences to initiate school records, invitations to attend meetings of certain school-sponsored clubs and a planned study of the school's *blue book*, or bulletin of information concerning the school's organization. During the first week of each semester, 9B pupils are permitted to leave class five minutes early to insure them a place in the cafeteria.

### Home Rooms

Organization is on the class level. All seniors are assigned to a senior home room, juniors to a junior home room, etc. This plan promotes class loyalty and affords an opportunity for special work on age levels. Pupils are enrolled with the same home-room teachers for three years. It is the duty of these teachers to inform their pupils of school activities, to keep the attendance record, to issue report cards, to read the daily bulletin, and to co-operate in furthering a comprehensive program for each class. Officers elected in the home room are president, vice-president, secretary, treasurer, agent for school paper, agent for yearbook, and representative to the girls' league.

### Testing Program

Tests are given each year on class levels as follows: for freshmen, a standard intelligence test; for sophomores, an interest preference test; for juniors, another intelligence test; for seniors, a personality inventory test.

Diagnostic and achievement tests are given by various departments for purposes of assignment. Certain aptitude tests are available for those who are interested. Sophomore English teachers assign oral or written reports following the *interest pref-*

*erence* test. The personality test is discussed in psychology classes.

### Vocational Conferences

Vocational conferences are scheduled for sophomores at the school. A survey is made of vocational choices, and discussion groups are scheduled. Each sophomore registers in two of these groups which represent his first and second vocational choice. Student chairmen, adult speakers, and faculty members conduct the forums. For juniors and seniors, *on the job* conferences are scheduled with leading men and women representing the industrial and professional field. These conferences are made possible by co-operating with interested civic clubs.

### Personality

Ratings are obtained for each pupil. Each year, two classroom teachers rate the pupil on the following ten points: dependability, adaptability, scholastic diligence, integrity, leadership, co-operation, social adjustment, manner, diction, and appearance. Each item is rated 1, 2, 3, 4, or 5. 1 rates above average, 3 rates average, and 5 rates below average. Citations are made by classroom teachers for approximately 5 per cent of their pupils who have been outstanding in some specific class, home room, or extracurricular activity.

### Placement

The vocational director assists present and former students to secure gainful employment. He keeps up-to-date files on employer request data, and student registration information. In addition, he has cards of introduction, placement cards, and follow-up cards. All requests for jobs, working hours, or permits are handled by the director.

### Special Advisers

And agencies include the following: vocational and college advisers who are also class advisers, scholarship adviser, college board adviser, director of tests and measurements, director of athletics, school nurse, home visitor, and director of extracurricular activities.

### Conclusion

The offices of the advisers have become centers for friendly help and assistance. Here, students are made to feel that they are always welcome and that they will always receive intelligent and concise answers to their questions. Here, the advisers assemble and interpret all available information in order to help students make intelligent decisions. Here, educational and vocational plans are made to prepare the student for better living in our complex society.

# Some Leaders in Industrial Education

**WILLIAM T. BAWDEN**
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The eminent historian, W. E. H. Lecky, is quoted as saying that "the study of history gives to young men something of the experience of old men." Perhaps one reason for this is that, as the well-known proverb has it, "history repeats itself." If we know thoroughly what has been, we can forecast more intelligently what is to be; certainly we can understand and interpret better what is. As another historian has said, "the substance of historical movements is permanent amid the manifold variations of historical events." Whether this be so or not, how often does the young leader, when promoted to a position of responsibility and charged with the making of important decisions, long for the wisdom that comes only with years of experience. And, on the other hand, how often does the old *wheel horse* wish he had the energy and the aggressiveness of some of the younger men he sees coming along after him.

In no field of endeavor is the study of history more important than in industrial education. A comparative newcomer in the educational system, it has had a phenomenally rapid growth. In comparison with the hundreds of years of organized instruction in language and mathematics, the history of industrial education is measured in decades.

Indeed, it may come as a surprise to some of the younger leaders, and especially to prospective teachers in training, to be told that the entire history of that phase of industrial education which we know as industrial arts has occurred during the lifetime of men and women now living and still active in educational circles. To be specific, the first so-called manual training school was opened at Washington University, St. Louis, Mo., on September 6, 1880. I was five years old in the fall of that year, though of course I knew nothing about Washington University until many years later. The statement merely emphasizes in a dramatic manner the marvelously short time it has taken for a great movement to develop.

I may go even further and say that far more than 90 per cent of this development has taken place since I was graduated from college and began my teaching career in 1896. The spread of the movement was very slow at first. The new schools of this type scarcely averaged one each year during the two decades following 1880. There was an observable turning point, or acceleration, in the development of industrial education at about the time I began teaching, for not until about that time was any provision made for the preparation of teachers. Undoubtedly the lack of properly qualified teachers was one of the major causes for the slow rate of progress in the early years. More will be said about this later.

From the very beginning of my career as a teacher I was conscious of certain shortcomings, and discovered quite early that I needed help. I was a graduate of the standard liberal arts or classical curriculum of that period. My four years of college did not fit me specifically for any calling, not even teaching, though that was all the preparation that many highly successful teachers had. It was intended to furnish a good foundation upon which to build, and it was that. In my case I had to do considerable building.

### Problems of the Teacher

During all these fifty years and more, therefore, I have been keenly interested in the problems of the teacher, and in what should be included in the preparation of teachers. In teaching, as in any other calling, one important means to self-improvement is the study of the lives of successful practitioners of the profession. When, in the fall of 1903, I was charged with the responsibility of developing a program for the preparation of manual training teachers, as we were called in those days, I began along with other measures to try to find out all I could about other

teachers of manual training. I wanted very much to know what qualifications, experiences, activities, and beliefs characterize the superior, or at least the successful teacher of shopwork and drafting.

Thirty years later, in the summer of 1933, I was given the opportunity to help in developing a program of postgraduate studies leading to the master's degree in industrial education at Kansas State Teachers College. By that time, I felt sure enough of my ground to organize a graduate course in "Leaders and Movements in Industrial Education," in which one of the stated objectives was "to develop appreciation of the historical background and lines of growth of the movement, and hence a more adequate understanding of the present status and significance of industrial education."

A study of the personalities and achievements of as many as possible of the leaders in industrial education constituted an important part of this course. I soon found, however, that it was extremely difficult to gather authentic information about the lives and personalities of these men. It was comparatively easy to learn about what the leaders said and wrote, for most of them were more or less regular contributors to professional journals, and most of them have left monuments in the form of books, manuals, pamphlets, and reports.

Very little, however, is available concerning the personalities of the leaders, and what little there is appears in fragmentary sketches scattered through the bound volumes of educational journals. These sources are available only in the larger college and university libraries, and not in all of them. Even so, I found that students do not have the time to search for these fragments and to assemble them in useful biographies.

In order to accomplish what I had in mind, I found it necessary to do much of the research myself, and to present the biographical data in lectures, while assigning students to work on other types of research problems. Through the years it has been my exceptionally good fortune to hold positions which brought me into contact with many of the leaders in all sections of the country. I found it possible, therefore, in many instances, to supplement the usual meager printed record with personal impressions.

### Stories About Leaders

On several occasions during recent years it has been suggested that I should write out my impressions of some of the early leaders in order that they may be published and made available to a wider audience. There have been so many of these requests that I feel encouraged to make the effort. With the notes and sketches that have accumulated through the years it is now chiefly a matter of finding the time to put the material together in form suitable for publication.

In casting about for a plan for selecting the subjects of the biographical sketches, I found one ready made. At the thirty-second annual meeting of the Manual Arts Conference of the Mississippi Valley, held at the University of Minnesota, October, 1941, a committee was appointed to select, publish, and distribute to members a set of portraits of leaders. The portraits were printed on heavy enameled paper, size 8½ by 11 in., suitable for framing. The subjects were selected by referendum vote of active members of the Conference, and included the following: Calvin Milton Woodward, Charles Russell Richards, Frederick Gordon Bonser, Ira Samuel Griffith.

The first of these sketches, therefore, will be that of Dr. Woodward.

### Interpretation of Industrial Arts

Before proceeding further, perhaps, I should say something in explanation of my use of the terms *industrial education* and *industrial arts*. I think of that part of education which is gained in school as potentially a continuous process, which, to be complete must include something more than development and training of the mental powers. It must include also nurture of the physical and emotional life of the individual. Its processes require participation by the learner in a variety of activities and experiences. A certain minimum amount of schooling may well be substantially the same for all children, but it seems entirely reasonable and logical to assert that the time inevitably arrives when uniformity of instruction, activities, methods, and experiences no longer suffices. If the ultimate product, in one case, is to be a skilled surgeon, in another a plumber, in another a teacher of mathematics, and so on, it is certain that at some point there must be divergence in the curriculum.

The practical impossibility as well as the social undesirability of *sorting out* children and young people in accordance with their probable destinations are what pose some of the insoluble problems of education. There is no clearly recognizable line of demarcation between general education and education that is given because of its specific contribution to the occupational objectives of the learner. With reference to some subjects in the curriculum it is impossible to say, at the time they are studied, whether they have vocational values or not. From this point of view much of the popular confusion concerning the assumed conflict between general education and vocational education is wholly unnecessary. Both are essential, and neither is complete without the other.

I think of vocational education as the broadest and most comprehensive term which includes all those parts or branches of education which contribute specifically to the occupational objectives of the learners. At least five types or divisions of vocational education are generally recognized:

*Professional education,* including preparation for teaching, the ministry, medicine, surgery, dentistry, engineering, the law, and possibly others. One point frequently overlooked is that the preparation regarded as essential for certain professions includes general education through two or three or more years of college, before specific vocational education may begin. Only the favored few can afford the luxury of so extended a period of general education.

*Agricultural education,* including preparation for a great variety of occupations concerned with the tilling of the soil, poultry raising, animal husbandry, forestry, and others.

*Commercial education,* including preparation for all types of business occupations.

*Homemaking education.*

*Industrial education,* including preparation for the various occupations in the mechanical trades and in manufacturing, producing, and transforming industries.

Just as vocational preparation for engineering or for teaching reaches down into the general-education language, mathematics, and science instruction of the secondary school (and even the elementary school) for its beginnings, so does vocational-industrial education reach down for its early beginning into the general-education shopwork and drafting of the secondary school and even the handwork of the elementary school. All these subjects (language, mathematics, science, shopwork, drafting, and others) are given in elementary and secondary schools primarily for their general education values, and because they are regarded as indispensable parts of the experience of all growing boys and girls. But they are given with the full knowledge that an undetermined proportion of these young people will ultimately derive vocational values from them. In the words of the A.V.A. Committee:[1]

[1] *Improving Instruction in Industrial Arts.* Report of Committee, American Vocational Association, 1010 Vermont Avenue, N.W., Washington (5), D. C., 1946, 96 pp.

"Industrial-arts courses are part of general education and do not have a distinctly bread-and-butter justification. They are assumed to generate sympathetic interest in the whole of industry, as compared or contrasted with agriculture, homemaking, commerce, and certain technical professions. Instructors in this field . . . seek merely to sample and to explain the mechanical world to young people in the hope of developing industrial and social intelligence rather than technical efficiency."

### Achievements in Both Fields

It is a significant fact that many of the leaders in industrial education made notable contributions both to vocational-industrial or trade training and to general education industrial arts. In most instances these leaders came to appreciate the place and importance of industrial arts as a basic preliminary to vocational industrial or trade training. Nearly every so-called trade school learned that if young men come as candidates for vocational training without having had opportunity in a good industrial-arts program to discover their interest in and aptitudes for machines, tools, and mechanical processes, then it is necessary, in the trade school, to provide the equivalent by means of a screening process in a special preliminary *general shop* organized for this purpose. Instead of being in conflict, therefore, general education industrial arts, and vocational-industrial education are properly conceived as successive stages in a continuous and unified program of experiences.

It is from this point of view and with this conception that we are to consider the lives of certain selected leaders in industrial education.

The first of this series of brief biographical sketches, that of Dr. Calvin M. Woodward, will appear in the next issue of this magazine.

# Outline of Related Subjects For Auto Mechanics

**HENSEL M. MILLER**
George Washington High School
Alexandria, Va.

Questions and answers covering the essential information required in Auto Mechanics I.

### General Shop Rules

1. How do you obtain the necessary tools?

*By requisition* — a small sheet prepared by the worker and giving (*a*) name of tool, (*b*) size, (*c*) signature of user. The tool clerk must refuse to issue tools unless the requisition is carefully and legibly prepared. *He will be responsible for unreturned tools.*

2. How are tools returned?

*a*) *Clean*: Tools must be clean and in good order when returned. They should be turned in as soon after the cleanup bell as possible unless an exception is allowed for overtime work.

*b*) *Lights*: The *drop cords* (lights) and *extension cords* should be coiled correctly on their boards.

*c*) *Clearance ticket*: All working students must have a clearance ticket at the end of the period, checked for *tools returned* and *clean* and signed by the *tool clerk.*

3. What are the general rules at quitting time?

*a*) *Care of parts:* Put all parts and items in a steel box and store safely until the next working period of the class.

*b*) *Floor spots*: Each worker must swab with gasoline any oil or greasy spots on the floor.

*c*) *Final inspection*: Each work station or bench occupied must be left in good order and clean, and checked on the *clearance ticket*, which is signed by the *shop foreman* when the student has satisfactorily completed his cleanup work.

4. How are cars protected?

*a*) *No marking*: There must be no grease or any other marking or spotting on painting, upholstery or other finished surface.

*b*) *Covers*: All fenders must be covered before work starts; also the seat and door upholstery protected if working in interior.

*c*) *A bench for each car*: Movable benches or cabinets must be taken to *all car jobs* and used for tools or parts. Nothing is allowed to be placed on fenders or running boards, whether covered or not. Where the job will require several days, the car's interior *if properly protected* may be used to store parts.

5. What are the main points in spark plug service?

*a*) *Correct wrench*: Secure the proper size socket and a handle combination that will allow a careful movement in removing.

*b*) *Porcelain breaking*: Very carefully hold the socket and handle in line with the plug. Sideway movement will break the porcelain.

*c*) *Blowgun*: After loosening the plug several turns, blow all dirt from the base of the plug to prevent its falling into the combustion chamber.

*d*) *Drying plugs*: Before sandblast cleaning, the plugs firing end must be perfectly dry. If there are any oily indications, it must be washed carefully in tetrachloride and thoroughly dried to avoid clogging the cleaner.

6. What safety precautions are necessary in underneath work?

*a*) *Axle stands*: A car elevated for underneath work must be securely supported by the solid or adjustable axle stands, one under each axle end that is raised.

*b*) *Wheel blocks*: Blocks may be used under the wheels if all four wheels are chucked to prevent the car from rolling in either direction.

*c*) *Goggles*: Be careful of falling dirt, oil, and gas. Use goggles if they do not interfere with the vision.

7. What safety precaution is vital in grinding?

Always wear the goggles when the grinding wheel is turning.

8. Why are batteries dangerous?

They are filled with a very caustic acid and some of it is usually on the outside. It corrodes and eats practically everything but glass and rubber. In testing and handling do not allow the battery or any of its acid to touch the clothes, floor, or anything that needs to be preserved.

### Automotive Machining

1. What is automotive machining?

It is the forming, shaping, or physical treatment of metal to make it serviceable in car operation.

2. What are the common machining operations?

Soldering, brazing, welding, flame cutting, sawing, chiseling, filing, punching, marking, drilling, threading, reaming, honing, grinding, boring, turning.

3. What is the difference between cast iron and steel?

*a*) *Steel — tough, stringy*: Steel is tough and stringy; in cutting operations the displaced metal holds together in long chips or curls. It can be bent or formed. Freshly cut surfaces have a shiny polished finish.

*b*) *Cast iron — brittle, granular*: Cast iron is granular in texture and brittle like glass, breaking if bent. The waste metal in cutting operations tends to pulverize. The metal when cut has a dull grayish appearance.

4. What difference should there be in cutting the two metals?

Largely in the matter of cooling the cutting edges of the tools. In steel, lubricating oil is best. Cast iron requires a nonlubricating coolant, such as kerosene.

5. What metals and what parts are soldered?

Brass or bronze, copper, light sheet metal or tin, aluminum, radiators, light metal tanks, electrical works.

6. What tools are required?

*a*) Soldering iron with arrangements for heating if the unit is not electric.

*b*) Independent source of heat, such as a blowtorch.

*c*) Solder, either with integral flux or an independent supply.

*d*) Cleaning tools; files, scrapers, emery cloth.

*e*) Suitable holding or supporting arrangements.

7. What are the main points in soldering procedure?

*a*) Proper heat in iron and work (sufficient to melt the solder readily).

*b*) Perfect cleanliness of iron and work.

*c*) Stable and convenient arrangement of work.

*d*) Directing the melted solder so it will be effective and not wasted.

8. What is the difference in appearance between a good and a poor job?

*a*) *Correct appearance*: Correctly applied solder should show a smooth, polished application with the edges merging evenly into the base metal.

*b*) *Failure*: Dark seams, drops or a beady, rough appearance and a tendency of the edges to tuck under indicate dirt, poor heating and general failure.

9. What is sweating?

*a*) *Explanation*: Solder has no torsional strength, it cannot stand bending or vibration and seams subject to much action should be reinforced with a patch *sweated* over the joint.

*b*) *Procedure*: The contacting surfaces are both *tinned* or covered carefully with solder. They are then put into contact and held as required and reheated so that the two solder layers will soften or *sweat* and unite as one bond.

10. What is the general use and procedure in brazing?

*a*) *Use*: Effective in uniting pieces of cast iron or the softer metals.

*b*) *Tools*: Acetyline torch, brazing rod, flux, aligning support.

*c*) *Procedure*: Heat to dull red, apply flux and rod.

11. What equipment is required for welding?

*a*) *Use*: Uniting steel and the denser, heavier metals.

*b*) *Tools*: (1) torch with acetylene and oxygen supply; (2) electric equipment; (3) rod (electric and acetylene); (4) goggles, helmets and protective clothing; (5) shielding material to prevent arc injury to other's eyes.

12. What is procedure?

*a*) Bevel edges to be united so that the filler metal can be directly applied to entire surface of edges.

*b*) The base metal of both joining sections must be melted into small pools and the molten filler metal added making complete fusion. The formation of the small pools is a continuous and successive process as the torch and rod move along the seam.

13. What type tool is used in hacksawing?

A long, slim, hard steel blade with small closely spaced teeth on one edge. These teeth point or slope toward one end of the blade and will cut in that direction only. Blades vary in the number and size of the teeth.

14. What is the best sawing method?

*a*) *Mounting the blade*: Stretch the blade tightly in the frame so the teeth will cut on the outgoing stroke.

*b*) *Pressure*: Firm even pressure is applied on the cutting outgoing stroke, and relieved as the blade returns. Avoid twisting the blade.

*c*) *Speed*: A steady, uniform pressure stroke is most effective.

*d*) *Holding the work*: The work must be held firmly and if very thin may need reinforcing supports to prevent vibration. Such work requires fine toothed blades and holding the blade at an acute angle with the work may help if the teeth tend to catch.

15. Where is chiseling used?

*a*) Severing rivet heads or splitting nuts that cannot otherwise be removed.

*b*) Rough cutting where limits are not exact.

16. What general rules are helpful in chiseling?

*a*) Keep a sharp edge on the chisel.

*b*) Use sharp, firm blows.

*c*) Hold the work solidly. If it can't be put in a vise hold it against the blows by heavy iron backing.

*d*) Protect self with gloves and goggles, and provide baffles to stop flying parts as they are knocked loose.

17. Where is punching used?

Mainly in driving pins from shafts or other parts.

18. What type or tool is best?

The driving end of the punch should be very nearly as large as the pin and flat to press evenly on the entire end of the pin.

19. What are the rules for use?

*a*) File off any burr or head on the pin. If the pin is tapered drive on small end.

*b*) The first blows must be heavy and sharp to start the pin immediately, otherwise the end may be enlarged and it will require removal by drilling.

*c*) Rigid support is absolutely necessary as any springing or giving of the work makes the blow ineffective. Any work that cannot be held in a vise should be backed up by heavy iron weights held firmly against the part containing the pin.

20. When is direct action knocking used?

To remove tapered shafts or pins whose smaller end protrudes and can be hit directly, as rear axles and steering gear connections. The small extended end is usually threaded.

21. What are cautions in removing tapered shafts by knocking?

*a*) *Injuries possible*: Where possible screw or hydraulic pullers should grip the retaining part and push the shaft to avoid the injuries from concussion. Rear axles are especially susceptible to damage as they are supported by delicate bearings.

*b*) *Knockers*: If the part is to be used again, knockers are available or can be improvised (a nut screwed halfway on the threads with a bolt into the other half and jammed against the tapered pin makes a good remover). The bottom of the knocker's hole must jam against the end of the pin so that direct solid transmission of the blow is provided with protection for the end of the pin and its threads.

*c*) *Steering linkage joints*: In the tapered ball pin joints of the steering linkage an effective method is to use a pry bar to pull the pins and hit sharply on the side of the retaining part with a heavy metal support against the opposite side.

22. How should a rear hub be removed?

If necessity forces the use of a knocker — elevate the opposite wheel. On opposite sides of the wheel being pulled, use two long prize bars or planks, footing against the spring. Outward pressure on the tire and wheel will help absorb the blows and relieve the bearings.

23. Why is marking used?

A sharp pointed center punch is necessary in marking the centers of holes. The indentation guides the drill bit accurately.

24. What equipment is used in drilling?

*a*) Drill bits.

*b*) Chucks to hold the bits. These are fastened to the shafts of special motors or driven by some form of power.

*c*) Plates or vises for holding work.

*d*) Some drill assemblies are portable for convenience where the work cannot be moved.

*e*) Pressing mechanism to permit forcing the edges of the bit into the metal.

25. What preparation of the work is necessary?

*a*) Accurate marking by sharp indentation to hold drill point in starting.

*b*) Securely fastening the work in a vise or to the press table. This is very important as it protects operator and equipment.

*c*) Clamp the bit tightly in the chuck by twisting the key in all three holes with full strength.

26. What should be the condition of the bit?

The two cutting edges should be sharp and straight and each at the same angle from the bit's center line. This can be measured with a bevel protractor and assures that both edges will cut evenly and the same amount. The metal back of the edges should be grouped so that it rises slightly to clear the metal left by the edge as it advances. This is necessary so that the edge can bite into the metal without an excessive pressure that would cause overheating.

27. What is the general drilling procedure?

*a*) Start the bit carefully and accurately in the indentation.

*b*) Apply sufficient pressure to make the bit cut not so much that the motor's speed will be retarded excessively. The motor might be burned.

*c*) Reduce the pressure as the bit nears the emerging or break-through point to avoid breaking the bit. The pressure against the center of the bit eases then and the edges may dig in too deeply and break the bit. Measure the depth of the hole at intervals if necessary to determine that point.

*d*) When using the portable electric, hold it firmly to prevent its whipping around and injuring the operator if the bit sticks.

*e*) When using hand pressure for a hole above ¼-in. diameter, it will be easier to use a smaller bit first and redrill or ream to the larger size.

28. What are the main differences in threads?

*a*) Diameter — marked on all thread cutting tools.

*b*) Pitch — also marked.

*c*) Size of threads.

29. What is pitch and how many pitches are used?

Pitch is the amount the thread advances along the screw in one revolution. In usage it is designated by the number of threads per inch. This number is marked on each tool designed to cut threads. There are two pitches, the N.C. and the N.F. for each diameter.

30. What are the two main types of threads and where used?

*a*) The U.S.S. or National Coarse, the larger thread, used generally in cast iron. Most holes in the cylinder block and transmission case have these.

*b*) The S.A.E. or National Fine is used mostly when both uniting pieces, such as bolts and nuts, are steel. The finer pitch gives a greater power in tightening and resists more strongly the tendency to be turned backward or loosened.

31. Why is it important to be certain that engaging threads match and start correctly?

*a*) Unlike threads of the same diameter will start engagement and will advance sufficiently with wrench pressure to ruin the threads. This may be very serious when the mutilated threads are part of a larger or important part such as a cylinder block.

*b*) Soft metal threads, like those used in oil and gas line fittings may be ruined and both pieces rendered useless unless extra care is used in aligning and starting them correctly.

32. What tools cut threads?

*a*) Outside threads are cut by dies. These have the general outline of a doughnut, except that they are flat and from ½ to ¾ in. in thickness. The V-shaped cutting teeth are on the concave sides of the hole. Dies are held in and turned by two handled wrenches called stocks. Each die is marked with the diameter of the screw it will cut, and its thread pitch.

*b*) Internal threads are cut by taps shaped like headless bolts with the driven end squared to fit into a driver called the tap wrench. Taps are marked for pitch and for the size of the screw for which it will cut threads.

33. What preparatory sizes are necessary before threading pins and openings?

*a*) The diameter of the screw or bolt stock must not exceed that stamped on the die.

*b*) Charts give the size of the bit to use in drilling for each size and pitch of tap and should always be followed. It is permissable to thread undersized screw or bolt stock, or oversize holes. The threads not being full size will be weak.

*c*) *Explanation*: On taps and dies the bottoms of the grooves between the cutting teeth are not intended to cut. If the teeth are driven into the metal their full depth or over, the bottoms of the grooves will be forced to tear the metal they touch and will probably be broken.

34. What is the procedure of threading?

*a*) Put oil on steel. Cast iron may be cut dry.

*b*) Turn tools carefully in forward direction until finished. If too much resistance occurs, especially in the smaller sizes, remove the tool and recheck size of the rod or hole to be threaded. Small taps break easily.

*c*) In turning to start the threads hold the die and stock in a plane at right angles to the work and the tap straight with the hole. A try square will be helpful in aligning taps.

*d*) It may facilitate the starting of the dies to bevel or taper the ends of the rod somewhat.

### Engine Principles

1. What makes the automobile engine operate?

A mixture of vaporized gas and air is (*a*) drawn into the combustion chamber, (*b*) compressed, (*c*) exploded, (*d*) discharged or expelled.

2. What is a stroke?

A stroke is a movement of a piston in one direction.

3. What is a cycle?

A cycle is four consecutive strokes: (*a*) down on inlet, inlet valve open; (*b*) up on compression, valve closed; (*c*) down on power, valve closed, (*d*) up on exhaust, exhaust valve open.

This series of actions is repeated continuously in each cylinder, while the engine is running.

4. What is the combustion chamber?

It is the space in the cylinder, closed at one end or at the top by the arched head and at the other end by the closely fitting piston, which is movable in the cylinder. Two ports, controlled by valves, are located above the top point of the piston's travel to allow the admission and exhaust of gas.

5. What does the explosion accomplish?

It quickly expands the gas that has been compressed into the combustion chamber, and pushes the piston downward toward the cylinder's open end. The power of this downward movement is transferred to the crankshaft.

6. What is the crankshaft?

*a*) *The full-length power line*: A centrally located fore-and-aft shaft runs from the front end of the car to the rear axle, carrying the power to the rear wheels.

*b*) *U-shaped bends or crank throws*: The front section in the engine is a heavy drop forged shaft, bent under each cylinder into U-shaped swings, usually called throws. These throws are *cranks* for turning the shaft and the whole is called a *crankshaft*.

*c*) *Main bearings:* The main bearing *journals* are the short, round smooth sections of the shaft between the throws. They lie in the straight center line of the shaft and are cradled in a row of bearings located in the bottom side of the cylinder block.

*d*) *Crankpins*: The outer swinging end of the throws that correspond to the seat in a rope swing are similar to the main journals and parallel to them. They are called the *crankpins*.

7. How do the straight moving pistons transmit power to the rotating crankshaft?

*a*) *The connecting rod*: The connecting rod is a light, strong rod of steel with bearings at each end. The small end hinges to the center of the piston, like a bell clapper; the larger end encircles the crankpin and forms the connecting rod bearing.

*b*) *Movements*: The explosion occurs with the piston at its top position and the crankshaft and arm also at the top of their circle, The power pushes the piston and the lower end of the connecting rod shoves the pin down and around.

(To be continued)

# Vocational Education and Society

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*(Continued from page 193 of the May, 1947, issue)*

### Preparing the Inventory

After equipment has been purchased it has to be distributed among the schools where it is to be used. Since the number of any item placed in the various schools varies, it is necessary for the director to have a record of the number of each item placed in each school. For example, the department may have purchased one hundred hammers of a particular variety and these may have been distributed 10 to School A, 15 to School B, 20 to School C, and 10 to School D. Since the director is responsible for the hammers, it is necessary that he have a record of the disposition he has made of them. In order that he may be able to compile this information it is necessary that he obtain at periodical intervals, from each school, an inventory of the equipment in use at the time of the report. In order to facilitate this each item of equipment is given a code number which is standard throughout the school system. These numbers are referred to in all orders or communications concerning the various items. A list of the items of equipment available with their appropriate code numbers is available in the office of each school and may even be in the hands of each teacher.

With this in mind the superintendent might require each principal to submit a complete inventory at the end of each year showing the condition of the equipment assigned to him at the beginning or during the current year. The form on which this inventory would be printed shows all of the items of equipment used in the schools. The principal would then fill in the required information opposite those items which are used in his school. The form in Figure 1, might be used by a director of industrial work in obtaining information from his teachers but it can readily be adapted to general school purposes.

The inventories submitted by individual shops or schools enable the director to compare one department with another or one school with another in regard to the wear and tear on equipment. When he finds that the breakage in one school is out of proportion to the others he may find it desirable to inquire into the cause and perhaps remedy the condition. As an illustration of this a case may be cited where the director found that the number of planes being broken in one shop seemed unreasonably high. On inquiring into the reason for the loss he discovered that the floor of the shop was concrete and that in most cases when a plane was dropped it was broken. This raised the question of which was the more economical — taking his loss in broken planes, or installing a wooden floor.

Similarly, one teacher built a better class organization than another, and, as a result, his loss of equipment is relatively low when compared with another teacher.

When we consider the departmental inventory, which is really a summary of those submitted by individual schools, it appears to have several advantages:

1. The director can tell at a glance how his equipment is distributed throughout the school system;
2. He can tell how many of each item he had at the beginning and at the end of the year;
3. He can tell exactly what the mortality is on each item through loss or breakage;
4. This knowledge makes it possible for him to tell precisely how much he must allow in his budget for replacements;
5. It provides evidence to the administrative officers that the director is business-like in his methods and can actually account for the equipment for which they hold him responsible.

It is not suggested that this is the only method of keeping an inventory. It is not even suggested that this is the best method. The important thing is that each director should have *a* method, one which will make it possible for him to discuss his equipment problems with teachers and administrators

**Dewberry Public Schools Industrial Education Inventory, 1945–1946**

| *Code No.* | *Name and Description* | *Jones School* | | *Sr. H. S.* | | *Jr. H. S.* | | *No. broken* | *Lost* | *Added* | *In store* | *Total* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | *Wood-shop A* | *Wood-shop B* | *Drafting A* | *Drafting B* | *Gen. metal* | *Paint-ing* | | | | | | |
| A100 | Drawing boards | | | | | | | | | | | | |
| A101 | T squares | | | | | | | | | | | | |
| A102 | | | | | | | | | | | | | |
| A103 | | | | | | | | | | | | | |

Fig. 1

| | *Code No.* | *Number and Description* | *Total at Beginning* | *Broken* | *Lost* | *Added during year* | *Total end of year* |
|---|---|---|---|---|---|---|---|
| *Drawing* | A100 | Drawing boards (size) | 25 | 0 | 0 | 0 | 25 |
| | A101 | T squares (size) | 25 | 2 | 0 | 2 | 25 |
| | A102 | Instrument sets (Make and No.) | 25 | 0 | 1 | 0 | 24 |
| *Woodwork* | B100 | Claw hammers (Make and No.) | 20 | 1 | 2 | 0 | 17 |
| | B101 | Augur bits (Make and No.) | 6 | 2 | 0 | 0 | 4 |
| | B102 | Nail sets (size) | 20 | 0 | 6 | 0 | 14 |

Fig. 2. Inventory form for Jones Jr. High School, 1943–44

on the basis of fact rather than on the basis of mere opinion.

It will be noted that the sample report shown above shows the status of the equipment in the Jones School. It is possible that there might be more than one drafting room or more than one woodworking shop in the Jones School. If this were the case then the teacher in charge of each shop would submit a separate report since each shop might have the same items of equipment, but in varying numbers.

When the director receives this information he is in a position to prepare a general inventory covering all of the shops and schools in the school system. A form such as is shown in Figure 2 might be used for this purpose.

# Secondary School Radio Courses

**WILLIAM R. STOCKING, JR.**
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New uses of radio made public since the war, and the increasing use of electron tubes in industry, will probably cause a demand for better radio training on the secondary school level. The preinduction radio courses, hastily organized during the war, should be "reconverted" and improved to meet this demand. Experiences in teaching the preinduction radio course and conversations with other teachers lead to two general conclusions: (1) that the students who take the course should be more carefully selected with respect to their intelligence, educational background, and interest in the subject, and (2) for a usable understanding of radio, practical experience in radio construction and experimentation should accompany the study of radio theory.

During the war, many students were placed in the radio classes who had neither educational background nor the required mental ability to learn the subject.

It will be a great step forward in education when counselors and administrators learn that machine shop, radio, and other technical courses are *not* courses suited to boys who lack mental ability. The following entrance requirements for radio courses are suggested:

1. The student should have an intelligence rating of A or B. This was required for radio training by the armed services.

2. The student's educational background should include at least a year of algebra passed with A or B marks; one or more semesters of physics or a course in the "Fundamentals of Electricity." Here again the work should be of A or B quality, and the *one* semester of physics should have included the subject of electricity.

3. The student should have a sincere interest in radio. Interest is such an important factor in learning radio, that there would be much justification for admitting a student "who has the radio bug" even if his algebra and physics marks were only C. A student "who has the radio bug" usually will have constructed one or more radio receivers at home and will show his interest by continually asking for suggestions as to how to improve his receiver's performance.

4. The passing of a "radio aptitude test."[1] A test could be devised which would test the adequacy of the student's background of algebra and electrical theory. Part of the test could include questions on simple radio terms and definitions which students really interested in radio could easily answer. This part of the test would be a partial indication of the student's interest.

The objective of radio courses on the secondary school level should be "to give a background in the fundamental principles of radio and electronics which will prepare students for some occupations and for more advanced study"[2] of the subject. The return of the "hams" (amateur radio stations) to the air is leading many students to desire amateur radio licenses. High school courses should help prepare students to pass the necessary government license examination. A school radio club with an amateur radio station is an interesting extracurricular activity that helps to build up and maintain interest in the radio courses.

Radio courses naturally will vary according to different conditions. Although radio is a very theoretical technical subject (a branch of advanced physics), radio construction and experimentation are necessary to give meaning to the theory. This necessary experience could be provided in a radio shop course to accompany the course in radio theory, construction, and experimentation might be practical in some places.

The radio shopwork should be arranged to follow and supplement the textbook used in studying the radio theory. (*Elements of Radio*, by Marcus and Horton is a good textbook often used in high school radio courses.)

The following construction projects and experiments are among those that could be included in a radio shop course:

1. Telephone experiment
2. Radio-frequency experiment
3. Crystal detector receiver
4. Diode electron-tube experiment
5. Diode detector receiver
6. Triode electron-tube experiment
7. Amplified telephone experiment
8. Bias detector receiver
9. One tube audio-frequency power-amplifier unit
10. Tuned radio-frequency voltage-amplifier unit
11. Half wave power pack
12. Full wave power pack
13. Phonograph amplifier
14. Grid peak detector receiver
15. Regenerative detector receiver
16. "Wireless phonograph"
17. Dynamic speaker experiment
18. Superheterodyne experiment
19. Microphone amplifier
20. Communications receiver operation experiment
21. Resonance tuning experiment
22. Armstrong oscillator
23. Hartley oscillator
24. Colpitts oscillator
25. Ultraudion oscillator
26. Tuned plate — tuned grid oscillator
27. Crystal oscillator
28. Neutralized triode R.F. power amplifier
29. Tetrode and pentode R.F. power amplifiers
30. Harmonics — experiment
31. "Tri-test" crystal oscillator
32. Frequency doubling R.F. power amplifier
33. Absorption type wavemeter
34. Electron coupled oscillator
35. Transmitter monitor
36. Short wave transmitting and receiving antennas
37. Pushpull R.F. power amplifier
38. Keying methods experiment
39. Class A, Class B, and Class C amplifiers experiment

[1] The navy's *Eddy Test* was very useful in selecting men for radio training. A test for high school students should be similar but less difficult.

[2] "Post War High School Radio Courses," by William R. Stocking, Jr., in the *Metropolitan Detroit Science Review* of September, 1944.

40. Loop modulation experiment
41. Grid modulation experiment
42. Plate modulation experiment
43. Cathode modulation experiment
44. Overmodulation indicators
45. Tube checking experiment
46. Volt-ohm meter experiment
47. Vacuum tube voltmeter experiment
48. Condenser checking experiment
49. Cathode ray oscilloscope experiment
50. "Magic Eye" tube experiment

Many students will desire to construct radio equipment for themselves. This should be encouraged because it helps to maintain interest, encourages more careful workmanship, and includes work with many basic radio circuits such as have been included in the projects listed above.

Many demonstration devices and much of the equipment used in the experiments can be constructed from parts salvaged from obsolete radios obtainable at a very low cost. A large department store donated 17 obsolete radios to Cooley High School, Detroit, for use in the preinduction radio courses. Boys who have had experience in constructing and operating radios will be glad to help build this equipment. Their contributions to the success of the course will give them a feeling of accomplishment. Money with which to purchase new supplies and equipment can be earned in the shop by helping the more advanced students repair radios. Other members of the faculty are usually glad to bring in radios to be repaired at profitable though reasonable rates. This directed repair work is valuable educational experience, especially as the commercial use of circuits being studied is pointed out.

In some schools there will be sufficient demand to organize a class in the radiotelegraph code. In other schools where there are only a few who want to learn the code, a telegraph key and code practice oscillator could be set up in a corner of the radio shop and in one corner of a study hall or school library. These oscillators should operate through earphones so that others will not be disturbed. Students could then give each other daily code practice. At Cooley High School, Detroit, there were twin brothers who had amateur radio operators' licenses. Each twin spent two class periods a day giving code instruction to other boys. When a code class was later organized, the twins gave valuable assistance to the instructor.

Job sheets can be effectively used in the radio shop. Each construction job or experiment should illustrate one or two principles of radio theory. These principles should be briefly explained at the beginning of the job sheet. The questions at the end should thoroughly cover the main points to be learned. Job sheets could use the following form:

Name of the job
Objectives
Radio theory
Tools and equipment
Material and parts
Procedure (Detailed step by step directions for constructing the job or performing the experiment)
Questions and exercises
References (This should include the textbook used in the theory class plus other radio books including *The Radio Amateur's Handbook.*)

When a student constructs a receiver or other device for himself, he should be required to answer the questions on the job sheets that explain the basic circuits used in the student's project.

In starting a radio course, many devices useful in teaching can be constructed in the school shop. In the first semester, the planning and construction of equipment and demonstration devices can be made a regular part of the course. Students enjoy helping the instructor draw up plans. They often make excellent suggestions. This "student and teacher co-operation in designing and constructing equipment from 'junk' parts helps to develop originality, resourcefulness, and analytical thinking."[3]

[3] "Preinduction Radio," by William R. Stocking, Jr., in the *Science Teacher*, October, 1943, issue.

# Industrial Arts Mechanical Drawing

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This discussion concerns the two basic divisions of mechanical drawing: theory and practice.

Definitions are of cardinal importance, especially when applied to objectives. Therefore, it seems apropos to define theory and practice to clarify not only this discussion but also my objective.

*Theory*, then, will be defined as a body of fundamental principles underlying a science or an application of a science; and *practice*, as the act or process of executing or accomplishing.

While teaching mechanical drawing I was astonished by the very obvious difference between the mental aptitude of my students and their manual awkwardness.

This difference became one of my avocational assignments which I briefly outlined:

1. Find the cause or causes of awkwardness.
2. Test derived hypothesis.
3. Devise means whereby this difference may be reduced.
4. Test means and record results.
5. Formulate further efforts.

The object of my attention was evidently manual awkwardness, the object of my curiosity was: why such awkwardness.

I began my investigation by examining my students' handwriting, especially the numerals. Then I devised simple exercises which they had to accomplish without instruction or guidance. The same exercises were repeated with instruction to show me how well they could do them. They were also informed that these exercises would be graded.

So far I obtained two indexes of their aptitude with a pencil.

Then I proceeded to question them as to the nature and extent of instructions and exercises that they had received and performed in the grade schools.

After these tests and findings I could summarize their qualifications: insufficient and inadequate instructions and training before coming to high school. This may be called an hypothesis.

This hypothesis was soon verified by questioning teachers of various grade schools. All the answers lead to simple statements, brief and expressive: "as long as it is legible; good enough; that's the way we have to do it."

A newspaper account confirmed my findings:

"The committee said answers furnished by employers of more than 200,000 high school graduates showed that graduates were unable to write legibly, compute accurately or use English correctly."

From this committee's report it is evident that if high school graduates are deficient it must be due to inadequate instructions and training in the grade schools, for the high schools are not training students in penmanship. There the students' penmanship becomes worse or it goes from good enough to bad enough.

The art teachers, in grade schools, show a great deal of pride in the accomplishments of their pupils, and so do the princi-

TABLE Nº1
FRESHMEN 1ST SEMESTER GROUP-A

| LETTERING | | | | THEORY OF MECH. DRAWING | | | |
|---|---|---|---|---|---|---|---|
| No. Students | Grades | Students % | Normal Curve % | No. Students | Grades | Students % | Normal Curve % |
| 2 | A | 6 | 7 | 11 | A | 37 | 7 |
| 6 | B | 19 | 24 | 8 | B | 27 | 24 |
| 12 | C | 39 | 38 | 7 | C | 23 | 38 |
| 6 | D | 19 | 24 | 4 | D | 13 | 24 |
| 5 | E | 16 | 7 | 0 | E | 0 | 7 |
| 31 | | | | 30 | | | |

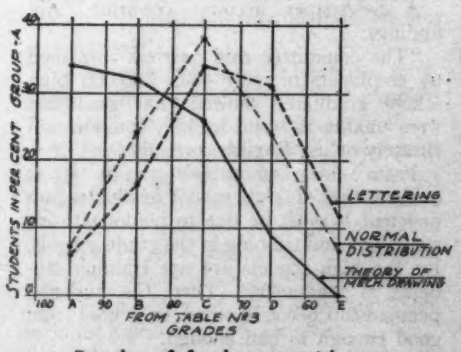
TABLE Nº2
FRESHMEN 2ND SEMESTER GROUP-A

| LETTERING | | | | THEORY OF MECH. DRAWING | | | |
|---|---|---|---|---|---|---|---|
| No. Students | Grades | Students % | Normal Curve % | No. Students | Grades | Students % | Normal Curve % |
| 1 | A | 4 | 7 | 7 | A | 29 | 7 |
| 3 | B | 12 | 24 | 9 | B | 38 | 24 |
| 7 | C | 30 | 38 | 7 | C | 29 | 38 |
| 11 | D | 46 | 24 | 1 | D | 4 | 24 |
| 2 | E | 8 | 7 | 0 | E | 0 | 7 |
| 24 | | | | 24 | | | |

TABLE Nº3
ALL FRESHMEN OF GROUP-A

| LETTERING | | | | THEORY OF MECH. DRAWING | | | |
|---|---|---|---|---|---|---|---|
| No. Students | Grades | Students % | Normal Curve % | No. Students | Grades | Students % | Normal Curve % |
| 3 | A | 6 | 7 | 18 | A | 34 | 7 |
| 9 | B | 16 | 24 | 17 | B | 32 | 24 |
| 19 | C | 34 | 38 | 14 | C | 26 | 38 |
| 17 | D | 31 | 24 | 5 | D | 9 | 24 |
| 7 | E | 12 | 7 | 0 | E | 0 | 7 |
| 55 | | | | 54 | | | |

**From these tables one can compare the results with each other and with the normal distribution of variates. The graph of Table 3 illustrates the data and their relationships.**




**Results of freshmen, mid-term examinations**

pals. How many teachers or principals display any pride toward the penmanship of grade pupils? Art and penmanship are very much related.

Now comes the delightful task of devising means whereby the difference between mental aptitude and manual awkwardness may be reduced, and perhaps eliminated.

The fact that there is perfect correlation between the graphic art and penmanship, which in mechanical drawing is called lettering, will furnish the basis of the means required for my task.

Lettering usually demands at least half the amount of labor required to accomplish a mechanical-drawing assignment. It is quite evident, then, that lettering should be used to attain several objectives.

A training program was immediately put into effect. Lettering was called freehand drawing. A pencil was a pointed instrument, in many ways, similar to a great number of instruments used in many vocations and professions. The objective was for each student to learn how to boss his hand so that by means of the instrument he would produce exactly what he had in his mind, or what his mind reflected.

The teaching and the accomplishment of exercises followed the technique becoming to freehand drawing: (1) appraise proportions, (2) block space, (3) subdivide space, (4) draw outline of picture (letters or numbers), (5) check outline against model, and (6) draw outline in desired weight.

All the exercises were organized in terms of geometric figures: (1) lines, vertical, horizontal, oblique; (2) rectangles, triangles, parallelograms; (3) circles, ellipses; (4) arcs of circles, arcs of ellipses; and (5) combinations to form letters and numbers.

Emphasis was placed on the importance of neat lettering and of simultaneously improving one's own penmanship.

At first the work progressed slowly, then it became a sport and the results were gratifying. The students learned: To appraise space; proportions, and subdivisions; to apply their awareness of plane geometry to mechanical drawing; to improve their penmanship; to draw freehand from pictures or models; to boss their hand and pencil as they would have to do with any other instrument.

I had more than two hundred students from September to the following June. They were grouped in different ways: two groups of freshmen, one semester each; two groups of sophomores, one semester each; one group of juniors, two semesters; and one group of seniors, two semesters.

None had studied with me before. All but the freshmen had had instructions and practice in mechanical drawing. My self-imposed assignment was extended to freshmen and sophomores.

The freshmen and sophomores were divided and assigned to groups according to their grade school records. In grade A

TABLE Nº4
FRESHMEN 1ST SEMESTER GROUP-B

| LETTERING | | | | THEORY OF MECH. DRAWING | | | |
|---|---|---|---|---|---|---|---|
| No. Students | Grades | Students % | Normal Curve % | No. Students | Grades | Students % | Normal Curve % |
| 0 | A | 0 | 7 | 2 | A | 8 | 7 |
| 1 | B | 4 | 24 | 5 | B | 20 | 24 |
| 7 | C | 28 | 38 | 6 | C | 24 | 38 |
| 8 | D | 32 | 24 | 8 | D | 32 | 24 |
| 9 | E | 36 | 7 | 4 | E | 16 | 7 |
| 25 | | | | 25 | | | |

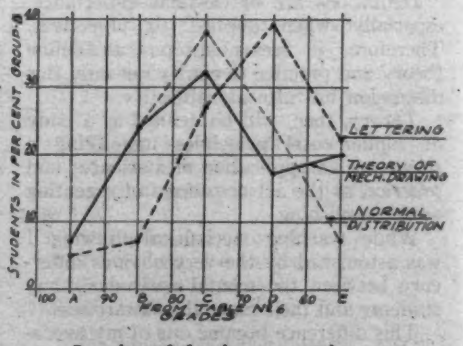
TABLE Nº5
FRESHMEN 2ND SEMESTER GROUP-B

| LETTERING | | | | THEORY OF MECH. DRAWING | | | |
|---|---|---|---|---|---|---|---|
| No. Students | Grades | Students % | Normal Curve % | No. Students | Grades | Students % | Normal Curve % |
| 3 | A | 9 | 7 | 2 | A | 6 | 7 |
| 3 | B | 9 | 24 | 9 | B | 26 | 24 |
| 9 | C | 26 | 38 | 13 | C | 38 | 38 |
| 15 | D | 44 | 24 | 2 | D | 6 | 24 |
| 4 | E | 12 | 7 | 8 | E | 24 | 7 |
| 34 | | | | 34 | | | |

TABLE Nº6
ALL FRESHMEN OF GROUP-B

| LETTERING | | | | THEORY OF MECH. DRAWING | | | |
|---|---|---|---|---|---|---|---|
| No. Students | Grades | Students % | Normal Curve % | No. Students | Grades | Students % | Normal Curve % |
| 3 | A | 5 | 7 | 4 | A | 7 | 7 |
| 4 | B | 7 | 24 | 14 | B | 24 | 24 |
| 16 | C | 27 | 38 | 19 | C | 32 | 38 |
| 23 | D | 39 | 24 | 10 | D | 17 | 24 |
| 13 | E | 22 | 7 | 12 | E | 20 | 7 |
| 59 | | | | 59 | | | |

**From these tables one can readily compare the results with each other and with the normal distribution of variates. The graph of Table 6 illustrates the data and their relationships.**




**Results of freshmen, mid-term examinations**

TABLE № 7
SOPHOMORES 2ND SEMESTER GROUP-A

| LETTERING | | | | THEORY OF MECH. DRAWING | | | |
|---|---|---|---|---|---|---|---|
| NO. STUDENTS | GRADES | STUDENTS % | NORMAL CURVE % | NO. STUDENTS | GRADES | STUDENTS % | NORMAL CURVE % |
| 1 | A | 5 | 7 | 2 | A | 9 | 7 |
| 6 | B | 27 | 24 | 9 | B | 41 | 24 |
| 8 | C | 36 | 38 | 8 | C | 36 | 38 |
| 7 | D | 32 | 24 | 2 | D | 9 | 24 |
| 0 | E | 0 | 7 | 1 | E | 5 | 7 |
| 22 | | | | 22 | | | |

TABLE № 8
SOPHOMORES 2ND SEMESTER GROUP-B

| LETTERING | | | | THEORY OF MECH. DRAWING | | | |
|---|---|---|---|---|---|---|---|
| NO. STUDENTS | GRADES | STUDENTS % | NORMAL CURVE % | NO. STUDENTS | GRADES | STUDENTS % | NORMAL CURVE % |
| 0 | A | 0 | 7 | 1 | A | 6 | 7 |
| 1 | B | 6 | 24 | 6 | B | 38 | 24 |
| 7 | C | 44 | 38 | 3 | C | 19 | 38 |
| 8 | D | 50 | 24 | 1 | D | 6 | 24 |
| 0 | E | 0 | 7 | 5 | E | 31 | 7 |
| 16 | | | | 16 | | | |

**Tables 7 and 8 show results from two groups which present very interesting contrasts**

were the better ones; in grade B those who were less skillful.

The courses of instructions were combinations of material taken from textbooks and from my professional-industrial experience. These instructions included: theory and practice in lettering; theory and practice in mechanical drawing; the elements of job organization; and technical arithmetic.

The objective was mechanical drawing with decidedly professional characteristics. The objective was attained by more than half of my students.

Time came for examinations and tests: (1) theory of mechanical drawing, including lettering; (2) lettering, and (3) exhibit.

The preparation of the examination questions in the theory of mechanical drawing demanded much care and attention to be as valid, reliable, and scientific as possible.

It is evident that to produce the simple drawings required of freshmen demands less knowledge than is required for the work of students of higher classes. With this well in mind the preparation of questions was accomplished to cover the requirement of all classes. In this matter a single standard was obtained. The task of seniors was to answer all the questions for a perfect score. Other classes were required to answer assigned numbers of questions from this single standard. Grades within each group were proportional to the relationship of correctly answered questions to the assigned number for each of the groups being tested.

This single standard system worked well. It measures student's aptitude to assimilate subject matter from lectures, and it showed the relationship between the different groups since all had the same field of questions to work from, and tested them for the same type of knowledge.

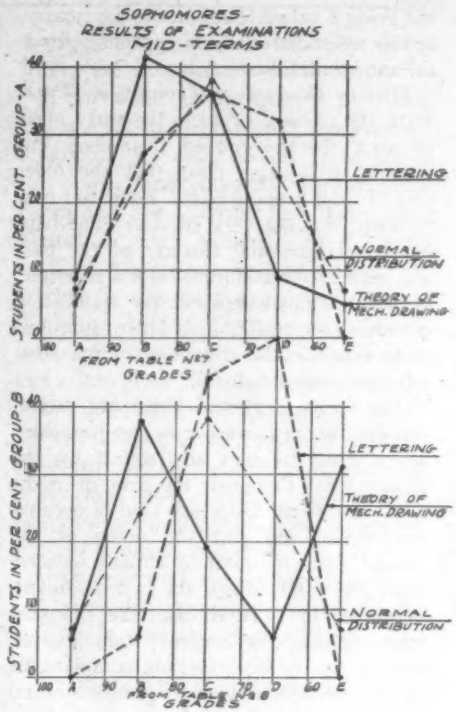
The exercises in lettering were based on the number of letters and numerals normally counted on drawings of the respective classes. These counts, properly weighed, furnished the number of good letters and numerals that students should produce during the test period for a perfect score. Grades within each group was a matter of proportion.

Grading papers was simply to count, and operate a slide rule. Students were permitted to participate in the process of appraising and counting acceptable letters and numbers.

The exhibit of drawings was professional. No one had to apologize for any of the plates shown.

Comparing grades revealed interesting facts as shown by the accompanying tables and graphs.

The data presented with this discussion are mid-term results. They show a significant lack of determination between lettering-test results and exams on theory of mechanical drawing. They illustrate the subject matter — the difference between mental aptitude and manual awkwardness, still persistent by mid-term. The final results showed a significant degree of determination (coefficient of correlation squared).




**Results of sophomore, mid-term examinations**

The method just outlined seems to be the alpha of teaching technical drawing.

# Inherent Therapeutic Values In Industrial Arts

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*(Continued from page 201 of the May, 1947, issue)*

### Definition and Elucidation of Occupational Therapy

It is evident from the foregoing discussion that occupation is essential to man's wellbeing. Let us now consider occupational therapy more in detail.

Occupational therapy has been defined as "any activity, mental or physical, definitely prescribed and guided for the distinct purpose of contributing to and hastening recovery from disease or injury."[14] The aim of treatment in mental cases is to relieve the suffering patients of "their symptoms, to restore their well-being, to replace their self-pity by self-confidence and constructive effort," and to help to restore the normal functioning of the mind. In short, it is to divert the interests, feelings, thoughts, and activities of the patient away from himself and direct them toward reality. Occupational therapy, it is well to remember, does not effect cures by itself,

[14]Haas, Louis J., "Practical Occupational Therapy" (Milwaukee: The Bruce Publishing Co., 1944), p. 15.

but being a valuable adjunct to psychiatry, it does assist materially in hastening physical and mental recovery.

*Modern Occupation Therapy at Work.* With the passage of time, the early ideas of work therapy proved themselves untenable. It became clear that the older idea of "just keeping busy," no matter how or what, was not very effective. The haphazard occupational therapy of the past was gradually transformed into a scientific, systematic, and comprehensive application of arts and crafts, and other approved occupations in the treatment of the mentally and emotionally ill.

The forms of mental illness are varied, and each variety presents its own problems, which must be met and solved by the occupational therapist. His bag of tricks must contain all and every kind of occupation which will suit the needs of the patient. Some occupations act as a sedative upon the mind, others act as a stimulant. Whatever the mental case, the therapist must "divert the patient from morbid fancies, engage his attention, stimulate his interest, and lead him to resume natural and healthy methods of thought and occupation,"[15] and above all, develop his will to become again an active unit in the world of reality.

*Occupational Program.* In order to realize the objective indicated, the scope of occupational treatment must of necessity be extensive. How inclusive such a program really is may be seen in the statement made by Dr. C. Chas. Burlingame, physician in chief of the Neuro Psychiatric Institute and the Hartford Retreat. He writes: "The program of occupational therapy includes not only making rugs and baskets, arts and crafts, and modeling, but instruction in music, in the fine arts generally, nature study, horticulture, domestic science, home nursing, and other occupations which may be directly related to the problems which will confront our guests on their return to their usual positions in society. It includes golf and tennis, outdoor sports generally, gymnasium work, pool, bowling, etc., which tend not only to restore both body and mind to normal but give an introduction to a permanent healthful hobby for the future. *These are the modern substitutes for powders and pills, restraint and force.*"[16]

What is the criterion in the setting up of such a large program of occupations? Every activity before it is included in the program of treatment must pass the following test: (1) Is it interesting equally to men and women? (2) Can it be presented and controlled so that the patients' reactions thereto are therapeutic? (3) Can the patient perform four fifths of all the work involved? (4) Does the activity appeal equally to all ages?

An activity may pass such a test, yet it does not follow that all occupations are of equal therapeutic significance. Every activity has its own inherent, varying therapeutic values. For this reason, a definite scale for evaluating an activity has been worked out by occupational experts. The list of occupations, which follows, is the result of the application of such a scale. The different activities are listed in the order of their therapeutic values, in which one means the greater and ten the lesser worth:

1. Basketry
2. Cord belt work, metalwork, jewelry
3. Printing and type setting
4. Bookbinding
5. Cabinetmaking, wood turning
6. Drawing, design, chair caning, brushwork
7. Outdoor construction, casting concrete furniture
8. Shoveling snow, raking leaves
9. Weaving, tennis, badminton, rackets
10. Blacksmithing, concrete construction

It is interesting to note in this connection that the occupations of the greatest therapeutic value are also the most popular, the stand-by subjects in the industrial-arts departments in our schools.

In summary, it may be said that an activity, in order to be of therapeutic worth, must produce these effects upon the mentally and emotionally ill:

1. It should increase his sense of self-respect and personal "worth-whileness."
2. It should produce readjustment upon an ever higher level of reality.
3. It should create a solid foundation in skills upon which constructive psychic readjustment can be made.
4. It should help in the substitution of healthful external activities for morbid subjective preoccupations.
5. It should promote emotional satisfaction through constructive occupational activities.

If these are the expected beneficial results of worth-while occupations produced upon the minds and emotions of the mentally ill, is it not safe to assume that these same occupations would also produce equally great stabilizing effects upon the *normal* individual whether in or out of school? What is this mysterious power of an occupation which exerts this salutary, beneficial influence upon the ill as well as the normal mind of a man whenever he comes in contact with it? Does an occupation produce these benefits by itself, something like a useful drug, or is it only a means by which the individual bridges the chasm from his mind to reality? This question we shall discuss in the subsequent section.

### Reciprocal Relations of the Physical and the Psychic Phases of Man

It must be clear to all interested persons that man's brain, considered in terms of the present, is the culminating result of growth over a long period of time. This fact is amply attested by the research of modern science. The human brain has developed into an organ whose work it is to unify or integrate the many different bodily processes and functions into a harmonious whole, thus enabling man to meet, to modify, and to control his environment. The human brain, being an organ without any direct contact with the external world, can exert its controlling influence upon it only through the senses. It is clear, therefore, that the senses must have antidated the origin and development of the brain. One of these senses which played an important function in the evolution of the brain is the sense of touch, which has been primarily associated with the human hands. "It is largely due to the hand's two functions, *prehension* and *touch*, that man has obtained the capacity of cognition and thought."[17] Because of this interplay "over an evolutionary period of many thousands of years, the sensory fibers of the palm and fingers, used incessantly to amplify the mental images furnished by the eyes, have become intricately elaborated, and that it is no exaggeration to say that considerable part of man's knowledge of the exterior world has been acquired through them."[18] This view is shared by other workers in this field. Thus the eminent English mathematician and philosopher Alfred N. Whitehead writes: "There is a co-ordination of senses and thought, and also a reciprocal influence between brain activity and material creative activity. In this reaction the hands are peculiarly important. It is a moot point whether the human hand created the human brain, or the brain created the hand. Certainly the connection is intimate and reciprocal."[19]

In the life of Helen Keller her hands certainly were the keys which unlocked the external world for her. Without her sensitive hands, she would have remained an animated bundle of humanity until her dying days. Recognizing the significance of the human hands in her own life, she writes a joyful praise of "The Seeing Hand" in one of her books: "My hand is

(Continued on page 240)

[15] *Ibid.*, p. 11.
[16] Davis, John E., "Employment Is Nature's Best Physician," *Hygeo*, April, 1942.
[17] Wolfe, Charlotte, Dr., "The Human Hand," Alfred A. Knopf, 1943, p. 12.
[18] *Ibid.*
[19] Whitehead, Alfred N., "The Aims of Education," Macmillan Co., 1929, p. 78.

# Industrial Arts and Vocational Education

John J. Metz, Editor

## LOOKING AHEAD

The day for closing the school shop for the year 1946–47 is rapidly approaching. Before locking up for the summer it is advisable to stop and consider what changes should be made before confronting the first class next year.

Undoubtedly, during the year, there were many occasions when the teacher saw that certain lessons should be improved. Some of the changes entailed extra work that could not be undertaken at the time when they were decided upon. Now is the time to take up those tasks.

The summer days offer opportunities for making the necessary drawings, doing the required research, and writing up the lessons, but nothing will be accomplished unless definite plans are made to tackle the job.

Help for this work may be found by looking through past issues of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Unobtrusively, the pages of this magazine present much helpful material. All of it has been published with the idea of helping our profession. It is there for you to adapt or adopt. The drawings, tables, and other material may be bodily carried over into your own work. It is true everything printed in the magazine is copyrighted, but that merely protects the author against others publishing this material as their own. For classroom use, however, everything in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION may be used just as it appears in the magazine, and for this purpose it may be duplicated in any way you may wish. It is there for you — make use of it.

## A NEEDED REMINDER

The summer vacation is again approaching. Naturally, the students are looking forward to this carefree time when there are no lessons to be prepared, and where, in most cases, there is no one to tell them what they must or must not do.

Unfortunately, the very fact that these youngsters can do what they please with little or no supervision is the cause of much vandalism, many accidents, considerable suffering, and a number of fatalities. Many of these untoward happenings could be avoided by a more active participation of the school in the supervision of the young during the summer months. Since this type of supervision is still in a very elementary state in most school systems, the best that the teacher, and especially the shop teacher, can do is to inform his students of the dangers they may encounter, and warn them of the consequences which may accompany some of their heedless acts.

Among the dangers that should be pointed out to them are those connected with traffic violations. Inform them that whether they are riding their bicycles, driving a motor scooter or an automobile, or when walking on the highway, there are certain rules to be obeyed. That any violation of these rules may result in injury or even death to themselves or to other persons, or it may mean injury or destruction of property all of which may be costly and usually unnecessary.

Then, there are the dangers that accompany water sports, picnicking, camping, and the like. Again, whether intended or not, any careless or thoughtless act may be followed by dire results. The unwatched fire, the carelessly thrown away match may start a fire that burns up homes, barns, and acres of forest lands, and probably causes the deaths of people and valuable livestock.

Inform your students on how to render first aid, give resuscitation aid, apply remedies for burns, insect and snake bites, and show the students how to recognize poisonous plants and berries.

And then do what you can to prepare your students against that dreadful plague — infantile paralysis, which may strike whole communities with epidemic-like severity, from early June to late September. Tell them to guard themselves against the ravages of this disease by carefully washing their hands before eating, keeping food protected against flies, getting sufficient sleep, not to swim in dirty water, and to avoid tonsil and adenoid operations if it is at all possible.

Tell them, too, that if the dread plague does strike, they should call in the doctor at once. The National Foundation for Infantile Paralysis, Inc., 120 Broadway, New York 5, N. Y., has pledged itself to see that no victim need lack proper treatment whether the family can pay for it or not. In other words, forget the cost but get the doctor.

Then warn them against the home "danger spots." Stairways account for about 25 per cent of the accidents in the home. Lawn mowers, wheelbarrows, rakes and hoes, shovels and forks cause almost as many accidents in the yard, as do the stairways in the house. The kitchen is the most dangerous room in the house, because there occur the burns (many of them fatal), the gas explosions, and many cuts that account for almost one fifth of all home accidents.

The National Conservation Bureau has classified the home accidents into six categories: falls, burns and scalds, asphyxiation and suffocation, poisoning, gunshot wounds, and fire.

Alert your students against all of them and make their vacation a safe preparation for future schooling and life.

## FINAL EXAMINATIONS

As the end of the school year approaches, the task of preparing, administering, and evaluating the final examinations and tests confronts every instructor of industrial arts and vocational education.

If the teacher has carefully preserved the past issues of this magazine, the job of preparing a usable test will not be so very difficult. Probably the most helpful suggestion of how to use the various tests that appear in this magazine from time to time was contained in the article entitled "Card File Test Building," on page 240 of the June, 1939, issue.

For those who want to write their own tests, a review of the two articles which appeared under the title, "Construction of Written Achievement Tests," on page 269 of the September, 1943, and on page 307 of the October, 1943, issues of this magazine, will disclose much helpful material.

The last five volumes of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, together with the issues from January, 1947, up to and including the present number, contain 115 articles on tests and testing. Out of this mass of material even the inexperienced test constructor should be able to provide himself, without much serious trouble, with a final test that will show what he has accomplished with his students, and give him an excellent chance for making out the final grade cards for the year.

(Continued from page 238)

to me what your hearing and sight together are to you. . . . All my comings and goings turn on the hand as a pivot. The hand is my feeler with which I reach through isolation and darkness and seize every pleasure, every activity that my fingers encounter. . . . With my hand I seize and hold what I find in the three worlds — physical, intellectual, and spiritual."[20]

Indeed, it may be said that the human hand is the best servant of man; the best instrument of work; the best translator of thoughts, and the best means for the creation of new thoughts. In a way, the hand acts as the visible part of the brain, because the body and mind are merely two aspects of the same single, integrated organism or oneness of man.

### The Sense of Touch in the Life of Man

Before pursuing this general line of thought any further, let us now take a few definite threads and see where they run and how they pull our other threads of thought together.

*Rousseau's and Pereira's Ideas Regarding the Senses.* Years ago Rousseau (1712–78) wrote this observation in "Emil": "Our first teachers of science are our feet, our hands, and our eyes. To learn to think, therefore, we must exercise the limbs, senses, and organs, which are the instruments of our intellect." To Rousseau the *whole* of the functional physical man was basic in the development of the mind. He, apparently, was not familiar with the teachings of Pereira (1715–80), who was a famous Spanish teacher of deaf-mutes in France. He was the originator of a sign language for the use of the pupils under his care. Pereira demonstrated to the physiologists of his time that the *tactile* sense was *the basic sense*, and that the other senses were, in terms of man's evolution, modifications of it. Basing his principles of education on this idea, he showed by his methods of teaching the deaf-mutes how much can be done by the training of the sense of touch so that it may "become an instrument ministering to the whole mental life." To Pereira the tactile sense was one of the most important links between the brain and the outside world. Without this link, the mind was like a house built on quicksand.

*Modern Studies of the Child.* Modern studies of child growth show clearly the role played by the hand of the child in the shaping of his images, thoughts, however primitive, and expression. Very early in the baby's life, in about the third or fourth month after birth, the "hand becomes the principal tool of tactile investigation" of his environment. At this stage of the child's life, his hands are into everything, to the despair of his mother, ever searching, probing, investigating, thus verifying, and absorbing new knowledge of a large part of the external world through his finger tips, as it were. Without this tactile evidence of the external world, his conception of the objects around him would be shadowy, vague, incomplete. Thus, a baby plays with his feet; he perhaps understands that his feet exist, but instinctively he "must also examine them with his hands before his mind, nourished by these tactile images, develops a three-dimensional conception of feet — in this case his own feet."[21]

*Language of Gesture in Infancy.* The language of gesture is the earliest means of expression for the developing child. A baby drops something on the floor; in order to get it back, he points at it with his hand. Thus lack of words is compensated for by the movements of the hand. As the power of speech develops, the language of gesture retreats into the background, nevertheless, it "remains throughout life as an accompaniment to words. Thus *words* and *gesture* have an intimate relation to each other and prove the connection of the hand with speech centers of the brain."[22]

*Learning to Read and to Write by Tactile Sense.* Writing, which is one of the most effective tools for expressing thought, depends completely on the hand. This fact also gives the convincing proof of the close co-operation between the hand and the brain.

Madame Montessori, who some years ago created quite a stir by her methods of education, taught reading as well as writing by means of the tactile sense. In one of her books on methods, she wrote: "We have the child touch the letters drawn upon the cards — using first the index finger only, then the index with the middle finger — then with a small wooden stick held as a pen. The letter must be traced in the fashion of writing."[23] Thus a child while learning to read also laid the foundation for the writing skill to be acquired later. In this connection, Madame Montessori wrote: "I provoked the movements characteristic of writing by having them touch the letters with their fingers. I exercised mechanically the psycho-motor paths, and fixed the muscular memory for each letter."[24]

Those senses which serve to receive and to transmit thought patterns by means of hearing and reading are also tied up with the hands. For example, to emphasize a point as well as to illustrate an action in a story, a reader or a storyteller must use hand gestures. Can any story be told without gestures? This applies with a particular force to stories told or read to young children. A gesture facilitates the flow of the story from the teller's mind through and out of his finger tips into the mind of the child, thus emphasizing certain points, and stimulating the child's imagination.

*The Hand as a Means for Expressing Emotion.* "As the hand is the most mobile and the most sensitive and expressive part of the body, it is no wonder that through its functional specialty, as well as through its representation in the brain, it should reflect every single emotion that the individual experiences."[25] Illustrations for this statement are not hard to find — perhaps they may be found even in the experiences of the reader of these lines. Take a symphony conductor as an objective illustration. With one hand he keeps time, while with the other he indicates the mood of the music to the players, who execute it by proper tonal phrasing. The one phase of his act is in a way mechanical, whereas the other is of emotional nature. It is said that Leopold Stokowski never uses a baton while conducting a symphony orchestra. He brings forth the emotional content of the composition by means of his "expressive hands." There is a color picture in the March, 1946, *Coronet* entitled: "The Hands of Katherine Cornell." Below it Carol Hughes writes these illuminating lines: "When Katherine Cornell won her first big role on the American stage, that of Sydney in 'A Bill of Divorcement,' she was paralyzed with fright. For Sydney was a complex personality. Miss Cornell says: 'As I tried to project the esoteric and elusive pathology of that character, I suddenly found my hands doing a great deal of my acting.' And it was her hands, not her face that arrested the attention of the audience. Her hands, disciplined by years of training, became the living symbol of doom and despair."

Can anyone imagine a ballet dancer on the stage with motionless hands? Look what intricate movements are performed by the hands of the dancer while in the act of expressing an emotional pattern! The hands are indeed a seismograph of emotional reactions!

*The Hand as a Symbol in Folklore.* In the course of man's development into a social being, he must have dimly sensed the significance of the hand in his daily social living. How else can one explain the idioms based on the idea of the human

[20] Keller, Helen, "The World I Live In," The Century Company, 1908, pp. 5, 28.

[21] Wolfe, Charlotte, Dr., *op. cit.*

[22] *Ibid.*

[23] Montessori, Maria, Dr., "The Montessori Method," F. A. Stokes Co., 1912, p. 265.

[24] *Ibid.*, p. 263.

[25] Wolfe, Charlotte, Dr., *op. cit.*, p. 22.

hand? To name only a few illustrations. An active co-operation in doing something is "To have a *hand* in a dozen different affairs." Ready and cheerful assistance is expressed as "A helping *hand*." To come in close contact means "*Hand* to hand." To be in actual possession of something is "*In the hand*." If anything is available, then it is "On *hand*." To get control is "To have the upper hand." To give aid is "To lend a hand." In the olden days a handclasp sanctified, as it were, the verbal contract of two or more parties. The hand and the spoken word were indeed the seal of trust.

There are many more idioms of like nature; but the few just given should suffice as indices of the symbolic significance of the human hand in man's life in the past.

What does this discussion of the relation of the human hand and mind add up to? This protracted discussion was necessary for the purpose of building up the background for the better understanding of the inherent therapeutic values of industrial arts. When we know that without the senses the mind has no means for coming in contact with the external world, and that industrial arts by its very nature requires the use of all the senses, then only will we be able to see how this subject may and does act as a stabilizer of the mind and emotions. This function of industrial arts we shall discuss more in detail in the next section.

(To be continued)

# Testing and Tests

## WHY BE CONCERNED WITH TESTING?

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Anyone who has helped start a training program in an Air Service Command installation may recall many obstacles which had to be removed before the classes could meet. One should not be surprised, therefore, to hear these programs characterized by such terms as *good* or *excellent*, because much work was necessary in order to get course outlines developed and approved, not to mention finding people willing to undertake the job of teaching the workers. But despite the apparent values seen in any such training, the person or persons in charge of the program must see to it that concrete evidence accumulates to verify these private opinions. This may be accomplished, in part, by developing a representative testing program for each course.

Good tests indicate knowledges and skills learners have mastered, and reveal difficulties learners are having. Thus the teacher obtains evidence of strengths and weaknesses in the course, and can plan for overcoming undesirable conditions. Since it takes time and thinking to develop useful tests, the following suggestions are offered for consideration:

1. *Determine the specific purposes of the test.* The general purpose of all tests is to judge learning. In a specific test it might be: "Does the worker know how to repair an airspeed indicator? Can he set up his machine and cut a keyway? or Can he prepare teletype machines?"

2. *Select knowledge, skills, or processes on which to question the learner.* This is an important step. One way to do this is to list separate items on cards, and then study each item considering: "Is this a fundamental point in the course? Does the teacher stress this point? Could a worker do satisfactory work without this knowledge?" Answers to such questions indicate representative facts and skills to test.

3. *Organize questions into convenient, workable forms.* Once the items have been determined, the test maker must put these items into test form. A variety of items selected suggests some variety in the test forms, therefore we may expect to see more than one type of question in the test. The specific types of questions used in the preparation of any test should be influenced by the items selected, and the manner whereby these facts were presented to the learner-workers. However, it should be made very clear that there is no basis for "variety for variety's sake."

4. *Allow proper time for the test.* Time is a basic consideration. Obviously a teacher builds more for a two-hour examination than for a test lasting 45 minutes. It is the task of the test maker to remember the time allowance when preparing any test form.

5. *See if language and vocabulary are understandable.* Regardless of the skill in defining purposes, selecting test items, formulating questions, and judging the time required for a test, the one who takes the test is doomed to failure if the test questions are cased in language beyond that used by the learner in his everyday conversations.

The teacher might profit by recalling just how he taught different facts, or demonstrated certain skills. It goes without saying that if the student cannot understand what is wanted by a certain question, his chances of supplying a satisfactory answer will be slight.

6. *Arrange test sections in correct order.* In a testing situation the one taking the test should have an opportunity to reason logically. Therefore a number of items dealing with the same subject are grouped together. Tests, if carefully made, challenge the student sufficiently without the encumberance of patchwork and puzzle sequence. Tests are supposed to promote the seeing of relationships by the learner. Consequently, the structure of the test should be such as to offer the worker opportunity to put new learnings to use even in the examination.

7. *Prepare answer sheet.* No test should be considered complete until the test maker has studied each item and recorded the correct answer. The answer sheet will be needed for efficient scoring of papers, and in the making of the answer sheet, the one who prepared the test gains additional insight as to whether or not: (1) The questions really test what they were designed to test. (2) The language and form chosen for each item is simple and concise. (3) The time allotted for the test is adequate.

8. *Check for representativeness.* Whether a test is designed to evaluate learning gained from a lesson, a unit, or an entire course, a desirable quality is representativeness. If this quality alone is respected a certain amount of fair play is injected into the test. Teaching should be paralleled by testing. When discrepancies exist between the material covered in classwork and information asked for in an examination, the test takes unfair advantage of the student, and is of little value. The successful teacher works hard to assure necessary learning. He spends no time on nonessentials that are just "nice to know." Similarly, the good teacher sees to it that main facts are the backbone of the test. He presents these facts in a number of ways always looking to see if the method is effective. In like manner the teacher reviews his tests constantly and remakes them when necessary, because he wants his test to represent a fair situation where learner-workers reveal the extent to which they have understood what the course aimed to present. Any old test in any old form will not be acceptable. Testing just to be testing is also undesirable. A test that is useful will be one that: (1) is constructed in keeping with certain definite pur-

poses; (2) is set up in form and language so that it is understood; (3) presents a task that is reasonable in view of past learnings and time allotted for the test; and (4) can be scored by a number of capable instructors with little or no variations in the final score.

Study the questions grouped under the following headings. These examples indicate how any teacher may develop tests indicative of good teaching. These samples, however, should not be construed as constituting a test, but rather as indications of how testing might be accomplished.

### Types of Test Questions

1. *Simple Recall*
   - A. What is the weight of acetylene gas? .....
   - B. What is the melting point of 1020 steel? .....
2. *Completion.* (Fill in blanks)
   - A. .....colors identify Pitot lines.
   - B. There are ..... classes of air corps drawings.
3. *Free Competition*
   - A. End mills are used to cut ..... and .....
   - B. Five objects that can be layed out by triangulation are (1) ..... (2) ..... (3) ..... (4) ..... (5) .....
4. *Controlled Competition.* (Underline correct answer)
   - A. A reference for performing an inspection on a mechanical shaft-driven tachometer would be TMI–413, TMI–412, TMI–420, TMI–409.
   - B. The type of chuck used most frequently on the machine lathe is universal, independent, magnetic.
5. *True–False* (circle correct answer)
   - A. Salt brine is used more than any other medium in the quenching of steel during the hardening process. *T F*
   - B. The identification color for exhaust analyzer lines is alternate light blue and brown. *T F*
6. *Yes–No.*
   - A. In resistance welding a heavy current is passed through the parts to be joined. .....
   - B. A standard turn is 3 deg. per second or a one needle-width deflection, right or left on the turn indicator. .....
7. *True–False–Doubtful.* (Circle the correct answer)
   - A. Superchargers are used to obtain a more efficient fuel charge in the cylinders. *T F D*
   - B. The three principal parts of the twist drill are the body, shank, and lip. *T F D*
8. *Multiple Choice.* (Underline correct answer)
   - A. The S.A.E. rating system divides all oils into (7,3,5,8) groups according to viscosities at (130 deg. F.; 110 deg. F.; 212 deg. F.)
   - B. The unit of resistance is the (volt, coulomb, ohm, watt)
9. *Best Answer*
   - A. To determine the correct heat-treatment of a piece of steel use (*a*) standard temper color chart; (*b*) soft pine stick; (*c*) pyrometer; (*d*) experience.
   - B. The purpose of airplane maintenance instruction forms is to (*a*) help the inspector keep his form 41B up to date; (*b*) show what specific job is required on a particular plane; (*c*) make the crew chief's job easier.
10. *Association.* (Place proper letter in blank)

| | | |
|---|---|---|
| A. Calibrate | ..... | Rockwell |
| B. Hardness | ..... | Casting |
| C. Surface gauge | ..... | Welding |
| D. Dolly | ..... | Concentricity |
| E. Squeezer | ..... | Rate of climb indicator |
| F. Seasoned | ..... | Riveting |
| G. Two-lipped end mill | ..... | Fuselage repair |
| H. Cleco clamp | ..... | Slots |
| I. Dial indicator | ..... | Stressed skin |
| J. Neutral flame | ..... | Layout work |

11. *Sequence.* (Number the steps in the order in which they should be done)
    Procedure for making No. 3 Morse Lathe Center:
    - .. Temper center
    - .. Locate and drill centers
    - .. Test taper fit with ring gauge
    - .. Finish turn taper
    - .. Test live centers
    - .. Polish live center of lathe
    - .. Turn taper end to 60 deg. (center gauge)
    - .. Set up machine to turn taper by the setover method
    - .. Relieve end to 11/16 in.
    - .. Mount work on centers
    - .. Rough out center to within 1.16 in. of size
    - .. Replace center with your job
12. *Diagrammatic.*
    - A. Draw a diagram showing an aircraft engine induction system.
    - B. Draw a simplified wiring diagram of a potentiometer.
13. *Essay.*
    - A. Tell how silk canopies should be cleaned.
    - B. Discuss the properties and uses of 17S–T Alclad Aluminum.

## COMPLETION EXERCISE ON ORTHOGRAPHIC PROJECTION AND DIMENSIONING

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*Directions:* In each of the following statements one or more words have been omitted. When the correct word or words are inserted in the blanks left for them, the statement will be specific and complete. Do not guess.

*Sample:* The *ohm* is the unit of resistance.

1. A line that has been bisected is divided into .... equal parts.
2. To bisect an arc is to divide it into .... equal parts.
3. An angle that is trisected is divided into .... equal parts.
4. A line is perpendicular to another line when it is at an angle of .... degrees to the other.
5. An inscribed hexagon is a .... sided figure drawn within a .....
6. A circumscribed octagon is an .... sided figure drawn about a circle.
7. An angle is a geometrical figure consisting of .... straight lines which intersect.
8. The .... of an angle is the amount of spread between the two lines which form the angle.
9. An ellipse is a plane figure which has two focal points, and which is bounded by a regular .....
10. An ellipse has .... axes at right angles to each other.
11. The longer axis is the .... axis.
12. The shorter axis is the .... axis.
13. A .... is a parallelogram having four equal sides and four equal angles.
14. A .... is a plane figure having six equal sides and six equal angles.
15. A .... is a plane figure bounded by a curved line called the circumference.
16. Orthographic projection is a method used to draw a detailed description of an object in two or more views on planes at .... angles to each other.
17. Every technical man or mechanic must have a thorough knowledge of the principles of .... projection in order to correctly read or make a mechanical drawing.
18. The picture planes in orthographic projection are known as the planes of .....
19. Lines drawn perpendicular to a projection plane and parallel to each other are called .....
20. When parallel projectors are drawn perpendicular to a plane of projection the result is an .... .....
21. There are .... principal planes of projection.
22. The three principal planes of projection are the .... plane, the .... plane, and the .... plane.
23. The three principal planes of projection used in orthographic projection are .... to each other.
24. The most important of the three principal planes of projection is the .... plane.
25. The .... angle of projection is universally used by draftsmen for making mechanical drawings in this country.
26. Using the third angle of projection, it is obvious that the .... view is directly above the front view and .... view is directly to the right of the front view.
27. According to the American Standard

Association's arrangement of views, a rectangular object can have as many as .... ordinary views.

28. A draftsman selects as the .... view in a drawing that face which best describes the characteristic shape of the object.

29. The three views most frequently used by draftsmen to describe an object are .... view, .... view, and .... view.

30. A draftsman selects views having the least number of .... lines.

31. Draftsmen usually prefer the .... side view to the left side view in a three-view drawing.

32. The .... view is preferred to the bottom view.

33. The front view of an object is projected on the .... plane.

34. The top view of an object is projected on the .... plane.

35. The right side view of an object is projected on the .... .... plane.

36. The two over-all dimensions found in the front view of an object are .... and .....

37. The two over-all dimensions found in the top view of an object are .... and ....

38. The two over-all dimensions found in the right side view are .... and ....

39. The over-all length of an object is identical in both .... view and .... view.

40. The over-all width of an object is identical in both .... view and .... view.

41. The over-all height of an object is identical in both .... view and .... view.

42. The .... view is drawn first, then the other views are grouped around.

43. The .... view describes the shape and size of the top surface of the object.

44. The top view is directly above the .... view.

45. The .... .... view describes the shape and size of the right surface of the object.

46. The right side view is directly to the right of the .... view.

47. A line is seen as a .... when it is perpendicular to a plane of projection.

48. A line is seen in its .... length when it is parallel to a plane of projection.

49. A line is .... when it is at an oblique angle to a plane of projection.

50. A surface is seen in its true shape when it is .... to a plane of projection.

51. A surface is seen as a line when it is .... to a plane of projection.

52. A surface is foreshortened when it makes an .... angle with a plane of projection.

53. A circular surface is seen as a .... when it is perpendicular to a plane of projection.

54. A circular surface is seen as a .... when it is parallel to a plane of projection.

55. A circular surface is seen as an .... when it is at an oblique angle to a plane of projection.

56. A mechanical drawing which accurately and completely describes an object in every detail is a .... drawing.

57. A detail working drawing consists of the necessary ...., ...., and .....

58. The .... shown on a detail working drawing describe the shape of the object.

59. The .... shown on a detail working drawing describe the size of the object.

60. The .... which must be brief, clear, accurate, and complete, are used to supply certain information about the object which cannot be given in any other manner.

61. Dotted lines are used to describe .... edges and surfaces of the object.

62. Dotted lines are of .... weight.

63. Dotted lines are composed of dashes .... inch in length and spaced .... inch apart.

64. The first dash of a dotted line always touches the full line from which it starts leaving no .....

65. When a dotted line continues as a full line, a .... is left between the full line and the first dash of the hidden line.

66. The .... of dotted lines always touch at the corners.

67. The dashes for dotted arcs start and stop at the point of .....

68. Drawings are dimensioned for the purpose of .... description and the convenience of the mechanic as a guard against errors during the process of production.

69. A working drawing must be completely dimensioned so that the drawing does not have to be .... for missing sizes.

70. A .... line is a fine, full line drawn parallel to the distance to be measured.

71. The dimension line is .... near its center with the dimension placed in the break.

72. At the ends of the dimension line carefully made .... are affixed.

73. The length of the arrowhead is approximately .... times its spread and it is made freehand.

74. A leader is a fine, full straight line terminated at one end by an .....

75. A .... is used to direct attention to a point, line, or surface to which a note or a dimension refers.

76. Leaders are ruled, never drawn .....

77. A center line is never to be used as a .... line.

78. A surface to be machined or finished is indicated by a .....

79. A code figure or letter is inserted in the opening of the V to indicate the .... of finish required on the surface.

80. The .... and .... for a counterbored hole is always given in a note on the drawing.

81. The .... and .... for a countersunk hole is always given in a note on the drawing.

82. .... is the correct note to be put on a drawing when an object is to be completely machined.

83. All dimensions up to and including 72 in. are expressed in .....

84. All dimensions greater than 72 in. are expressed in .... and .....

85. When all dimesions are expressed in inches the .... symbol following the dimension figure is omitted.

86. Extension lines are fine, full lines and start about .... in. from the object lines.

87. Extension lines usually extend about .... inch beyond the dimension lines.

88. The .... of a circle is always given; never give the radius.

89. The abbreviation .... follows the dimension indicating a diameter of a circle unless it is apparent that the dimension indicates a diameter.

90. The abbreviation .... follows the dimension indicating a radius.

91. A dimension is not to be .... except as an aid to clarity.

92. Dimension figures are .... inch in height, and the fractions .... times the height of the whole number.

93. Horizontal dimensions should read from .... to .....

94. Vertical dimensions should read from .... to .....

95. Inclined dimensions should read from .... to.....

96. An angle is dimensioned by placing the figure ...., using an arc as a dimension line.

97. The bar separating the fraction is .... with the dimension line.

98. Dimensions placed on parallel dimension lines are to be .... to avoid confusion.

99. In a three-view drawing dimensions are placed .... the views.

100. In a two-view drawing dimensions are placed to the .... of the views.

**KEY TO TEST**

1. two
2. two
3. three
4. 90
5. six, circle
6. eight
7. two
8. size
9. curve
10. two
11. major
12. minor
13. square
14. hexagon
15. circle
16. right
17. orthographic
18. projection
19. projectors
20. orthographic projection
21. three
22. vertical, horizontal, profile
23. perpendicular
24. vertical
25. third
26. top, side
27. six
28. front
29. front, top, side
30. dotted
31. right
32. top
33. vertical
34. horizontal
35. right, profile
36. length, height
37. length, width
38. width, height
39. top, front
40. top, side
41. front, side
42. front
43. top
44. front
45. right side
46. front
47. point
48. true
49. foreshortened
50. parallel
51. perpendicular
52. oblique
53. line
54. circle
55. ellipse
56. working
57. views, dimensions, notes
58. views
59. dimensions
60. notes
61. invisible
62. medium
63. 1/6, 1/16
64. space
65. space
66. dashes
67. tangency
68. size
69. measured
70. dimension
71. broken
72. arrowheads
73. three
74. arrowhead
75. leader
76. freehand
77. dimension
78. 60 deg. V
79. class
80. diameter, depth
81. diameter, angle
82. finish all over
83. inches
84. feet, inches
85. inch
86. 1/16
87. 3/8
88. diameter
89. D
90. R
91. repeated
92. 3/8, 1 2/3
93. left to right
94. bottom to top
95. left to right
96. horizontally
97. parallel
98 staggered
99. between
100. right

# TEST IN WOOD CONSUMER GOODS

**WILLIAM H. BOWERS**

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Tuckahoe, N. Y.

### First Ten-Week Period

One hundred statements follow, some true, some false. If the statement is true, place a *T* before the statement. If the statement is false, place an *F* before it. To determine your score, deduct 1½ per cent for each statement answered incorrectly. Subtract the total thus obtained from 100 per cent.

( ) 1. Fifty per cent of the land in the U. S. is covered by forests.
( ) 2. The most important world forest areas are in France, Peru, and Mexico.
( ) 3. Blights, insects, and worms destroy thousands of trees each year.
( ) 4. Erosion is greatest in forest areas.
( ) 5. In forest areas the air is always cooler in the summer.
( ) 6. Drought is not found in forest areas.
( ) 7. Our national parks were founded to provide good hunting and fishing areas for people.
( ) 8. Wood is a good conductor of heat.
( ) 9. Maple wood is easy to work.
( ) 10. Wood, weight for weight, is as strong as iron.
( ) 11. Looking at a cross section of a tree we find five divisions.
( ) 12. A tree can be identified by its bark.
( ) 13. The part of the tree nearest to the bark is called the heartwood.
( ) 14. The sapwood is dead wood.
( ) 15. The sapwood is darker in color than the heartwood.
( ) 16. The heartwood contains more water than the sapwood.
( ) 17. The heartwood is more durable than the sapwood.
( ) 18. By counting the annual rings you can ascertain the age of a tree.
( ) 19. Some of the sequoias of California have ring counts of 5000.
( ) 20. These sequoias have a bark 6 in. thick.
( ) 21. The above tree is often 400 ft. high.
( ) 22. The grain is the result of the medullary rays.
( ) 23. The beauty and value of wood depends upon the age of the tree.
( ) 24. The rays in oakwood give this wood a flaky appearance.
( ) 25. Fifty per cent of all wood used in furniture construction is hardwood.
( ) 26. All trees in the hardwood group shed their leaves in the fall.
( ) 27. The cells of softwood trees are thin.
( ) 28. Most softwoods have needlelike leaves.
( ) 29. There are five distinct forest regions in the United States.
( ) 30. Trees are cut down in the spring and summer.
( ) 31. A V-shaped notch is cut in the tree on the side where it will fall.
( ) 32. After the tree is felled the branches are removed.
( ) 33. Horses, railways, trucks, tractors, and rivers are employed to transport the logs to the mill.
( ) 34. The logs are stored in sheds to prevent deterioration.
( ) 35. Quarter-sawed wood works easily and quickly.
( ) 36. Lumber will shrink and warp if the water or moisture is removed.
( ) 37. There are two methods of seasoning wood.
( ) 38. When lumber is dried in the air the entire moisture content is removed.
( ) 39. Kiln drying lessons the time necessary for seasoning wood.
( ) 40. Seasoned wood rots quickly.
( ) 41. To assure long life to wood, ties, poles, and shingles are coated or impregnated with creosote oil.
( ) 42. Veneer is a thin slice of good wood glued to another piece of inferior wood.
( ) 43. The veneer is usually 3/16 in. thick.
( ) 44. There are five methods in the manufacture of veneers.
( ) 45. Ninety per cent of the veneers manufactured in the United States is done by the rotary process.
( ) 46. In the rotary method the wood is softened in warm water, then cut with a knife into thin strips.
( ) 47. Plywood and veneer construction are synonymous.
( ) 48. Fences and railroad ties are veneered stock.
( ) 49. Two pieces of veneer glued to a veneer core is known as a three-ply.
( ) 50. Veneer type furniture is much cheaper than solid wood construction.
( ) 51. Veneer is easily carved.
( ) 52. A veneer surface sometimes peels off exposing the inferior core.
( ) 53. Furniture is a good reflection of a historical period.
( ) 54. Massive and powerful pieces of furniture express the feelings of a nation confident of its power.
( ) 55. The chief characteristic of our modern furniture is its decorativeness.
( ) 56. The old standards are still mostly used by the furniture designer of this day.
( ) 57. Handmade furniture is cheaper than factory-made furniture.
( ) 58. Simplicity in furniture design is not desired by home folks.
( ) 59. Furniture reflects both the age and the personality of the buyer.
( ) 60. Modernistic furniture, trimmed with chromium, is suitable for all homes and people.
( ) 61. Renaissance furniture was very light and free from carvings.
( ) 62. Tudor furniture was extensively made between the years 1700 to 1850.
( ) 63. During the Tudor period the wood used most was maple.
( ) 64. The principal wood used during the Jacobean period was oak.
( ) 65. The gate-leg table originated during this period.
( ) 66. William and Mary furniture had inverted bells on the legs and a serpentine curve on the bottom of the chairs and tables, connecting the legs.
( ) 67. Queen Anne furniture featured the cabriole leg and hooped backs in chairs.
( ) 68. The Chippendale period was from 1750 to 1800.
( ) 69. Chippendale was the best known of the English cabinetmakers.
( ) 70. Thomas Sheraton was the most famous furniture designer in England between 1751 and 1806.
( ) 71. The furniture in the Louis XIV era was cheap, informal, and comfortable.
( ) 72. American furniture was simple in design and very sturdy.
( ) 73. The furniture made by Duncan Phyfe was slender, curved, and graceful.
( ) 74. Modern furniture stresses comfort and simplicity and veneer woods.
( ) 75. Upholstery frames are made of pine, whitewood, and basswood.
( ) 76. Slip covers are made from brocades, velvets, and tapestries.
( ) 77. White waste is an excellent material to use when dusting furniture.
( ) 78. If the air is too dry in your house the furniture will warp and crack.
( ) 79. Wood that has turned white may be restored to its original finish by the application of alcohol.
( ) 80. When buying furniture, test same for use, comfort, and suitability in your home.
( ) 81. Veneer furniture can easily be detected upon close scrutiny.
( ) 82. A good piece of machine-carved furniture is more desirable than a poor piece of hand-carved furniture.
( ) 83. Backs and bottoms should be nailed, not glued.
( ) 84. Well-seasoned wood cracks and warps.
( ) 85. The best place to buy antiques is from a local dealer in old furniture.
( ) 86. A piece of furniture 75 years old is considered an antique.
( ) 87. An antique reproduction is made from old material and from an old pattern.
( ) 88. In purchasing an antique mahogany piece that looks old because of worm holes, remember that worms do not like mahogany.
( ) 89. The tracks of the old hand plane are usually discernible on the bot-

tom of a piece of antique furniture.
( ) 90. A real antique piece contains both new and old woods.
( ) 91. Basswood is used for the construction of most frame houses.
( ) 92. Nails always make for permanent joinery.
( ) 93. Many small wood articles are being supplanted by metal articles.
( ) 94. Cherry is a heavy wood used extensively for building construction.
( ) 95. Maple is of medium weight, very strong, and wears well.
( ) 96. Pine is a hardwood used extensively in the manufacture of railroad ties.
( ) 97. Poplar is light and soft, of a fine grain, and quite durable.
( ) 98. Walnut is expensive wood, rich in color, and capable of a high polish.
( ) 99. Oak is a wood that is strong and hard, heavy and tough.
( ) 100. Millwork applies to all kinds of goods that are shaped by machinery.

**KEY FOR TEST — WOOD CONSUMER GOODS**

| | | | | |
|---|---|---|---|---|
| 1. F | 4. F | 7. T | 10. T | 13. F |
| 2. F | 5. T | 8. F | 11. F | 14. F |
| 3. T | 6. T | 9. F | 12. T | 15. F |
| 16. F | 33. T | 50. T | 67. T | 84. F |
| 17. T | 34. F | 51. F | 68. F | 85. F |
| 18. T | 35. F | 52. T | 69. T | 86. F |
| 19. F | 36. F | 53. T | 70. T | 87. F |
| 20. T | 37. T | 54. T | 71. F | 88. T |
| 21. T | 38. F | 55. F | 72. T | 89. T |
| 22. T | 39. T | 56. F | 73. T | 90. F |
| 23. F | 40. F | 57. F | 74. T | 91. F |
| 24. T | 41. T | 58. F | 75. F | 92. F |
| 25. F | 42. T | 59. T | 76. F | 93. T |
| 26. F | 43. F | 60. F | 77. F | 94. F |
| 27. T | 44. F | 61. F | 78. T | 95. T |
| 28. T | 45. T | 62. F | 79. F | 96. F |
| 29. F | 46. T | 63. F | 80. T | 97. T |
| 30. F | 47. T | 64. T | 81. T | 98. T |
| 31. T | 48. F | 65. T | 82. T | 99. T |
| 32. T | 49. T | 66. T | 83. F | 100. T |

# Problems and Projects

## THE BOOKSTAND AS A BEGINNING PROJECT

**H. A. ALLENDER**
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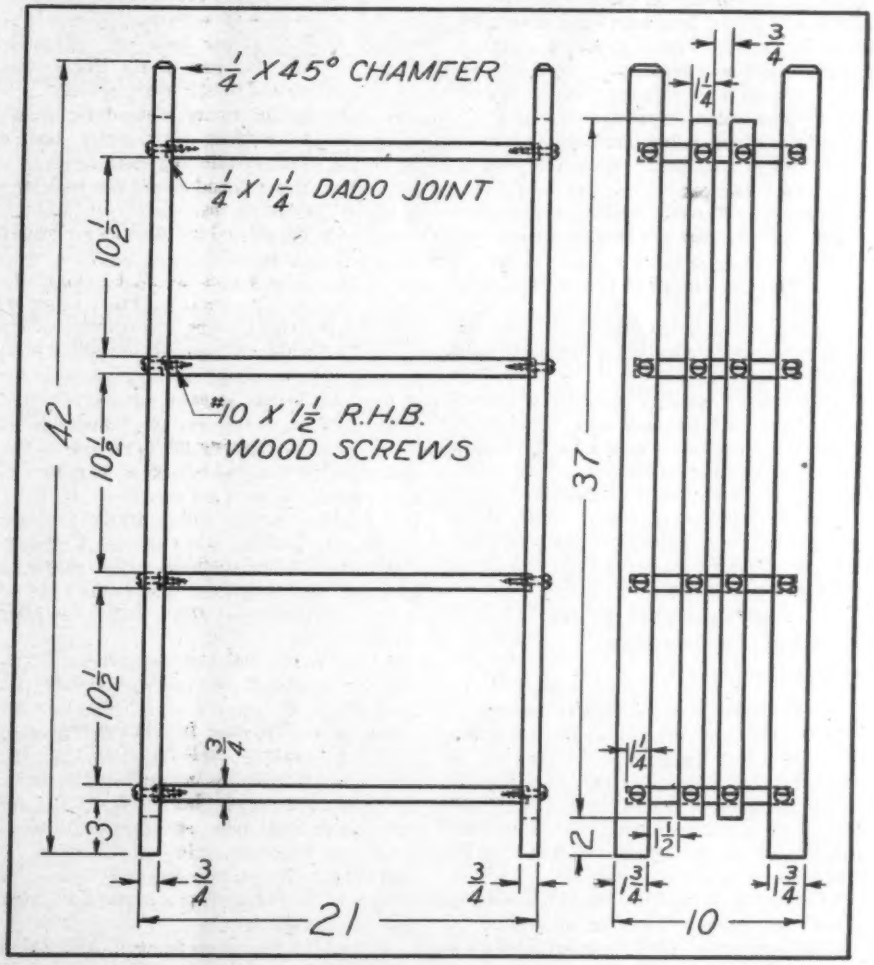
This article is a summary of the efforts of the author relative to the selection and use of a common project with which to start senior high school beginning woodworking classes in the fall. The project finally chosen is a bookstand made of four legs, four shelves, and four slats. It employs blind dado joints, and the shelves are fastened in place with r.h.b. screws. The bookstand was selected keeping the following points in mind:

1. Teaching-learning situations involving fundamental woodworking processes
2. The utility of the finished project
3. The cost of the finished project
4. The design which includes strength, proportion, and simple decoration
5. Necessary materials
6. The wood finishing processes involved
7. The time required to make the project by the average student
8. Contributions made to the objectives sought for in the high school woodshop

The making of the bookstand includes the following listed fundamental woodworking processes:

1. Preparation of project plan sheet
2. Squaring S2S stock to finished dimensions (legs)
3. Laying out and planning chamfers
4. Laying out and cutting blind dado joints in the legs
5. Laying out and drilling anchor holes in the joints in the legs for No. 10 by 1½-in. r.h.b. screws
6. Squaring S2S stock to finished dimensions (shelves)
7. Laying out and drilling pilot holes in shelves for the screws
8. Cleaning up parts preparatory to assembling (planing, scraping, and sanding)
9. Assembling (No. 10 by 1½-in. r.h.b. screws)
10. Preparing the project for finishing
11. Application of wood stains
12. Application of shellac
13. Use of steel wool as an abrasive
14. Application of furniture wax
15. Figuring cost




Bookstand

The bookstand also may be used for storing groceries, shoes, socks, hats, gloves, or other small articles, or it may be used as a stand for flowers, smoking utensils, the telephone, or in the sickroom.

The cost is nominal, approximately two dollars, including lumber, finish, and hardware.

The design is simple and sturdy, and the project presents opportunity to apply three definite items of simple decoration, chamfers on top ends of legs, two slats on each end between legs, and r.h.b. screws.

The materials successfully used for making the bookstand have been yellow pine, cypress, gum, magnolia, poplar, sycamore, and basswood.

The most successful finishing processes used in the past have been the following:

1. Stain (oil penetrating)
2. Shellac (first coat)
3. Rubbing with steel wool
4. Shellac (second coat)
5. Rubbing with steel wool
6. Application of furniture wax

NOTES: (1) Wood filling not required on the woods mentioned. (2) Shellac and stain were applied with the brush.

The time required for making the bookstand by the average student in the author's shop is eight school weeks. This leaves the student 24 weeks in the school year in which to select projects of his own choosing.

The use of this project has accomplished the following in the author's shop:

1. Makes group instruction possible as well as effective in large classes from the start of the school year.
2. Provides opportunities for the instructor to find out what the new students know and can do.
3. Provides a competitive spirit among students.
4. Makes possible the organization and the issuing of supplies quickly to all students from the very start.
5. Provides a gradual selection of subsequent diversified projects later as students complete the bookstand only a few at a time.
6. Greatly improves the quality of workmanship on subsequent diversified projects due to the fact many fundamentals, which were included in the making of the bookstand, have already been learned.

## BREAK-EVEN POINT

**G. HAROLD BILLINGHAM**
Weehawken, N. J.

### Mass Production vs. Hand Methods

By making use of the *break-even* points on a total cost chart, the decision as to whether or not to make up a template, fixture, or special setup is placed on an actual cost basis. Too often the judgment of a foreman has decided the procedure, sometimes to the disadvantage of the company.

The total cost chart makes use of *Cost in dollars* and *number of units* to get the result. An example will illustrate how easily a problem can be solved.

A unit requiring the drilling of eight holes costs five dollars to produce. The labor charge includes chalking the surface, scribing circles, spotting centers, spotting circles, and drilling. Repetition does not cut the cost, as shown by line *A*. One unit costs $5, 30 units cost $150, etc.

By making a template at an outlay of $50 the labor cost per unit was reduced to $3. There would be a fixed overhead on the job of $50, shown at the start of line *B*. The crossing point of line *A* by line *B* shows that 25 units must be template produced in order to break even (25 units × $5 = $125). Beyond this point a template pays dividends.

By designing and building a fixture which would cut the estimated labor cost to $2, there would be a fixed overhead of $150 (expense for fixture) shown at the start of line *C*. The crossing point of line *A* by line *C* shows that 50 units must be fixture produced in order to break even (50 units × $5 = $250). Beyond this point a fixture pays dividends.

A *gang drill* setup might be listed at $300, and the estimated labor cost cut to $1 per unit. The fixed overhead would then be $300 shown at the start of line *D*. The crossing point of line *A* by line *D* shows that 75 units must be gang-drilled produced in order to break even (75 × $5 = $375). Beyond this break-even point a gang-drill setup would pay dividends.

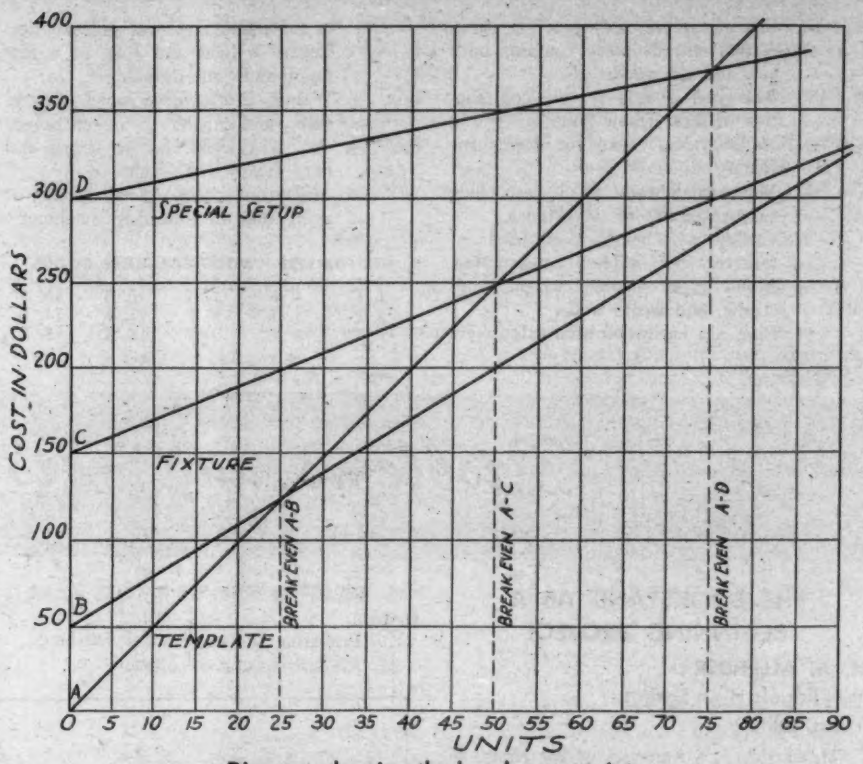



**Diagram showing the break-even points**

*Summary*

Method A. Standard procedure. Unit labor cost fixed at $5.

Method B. Template expense, $50. Labor cost estimated at $3 per unit. Break-even point — 25 units.

Method C. Fixture cost, $150. Estimated labor cost $2 per unit. Break-even point — 50 units.

Method D. Gang-drill setup, $300. Estimated labor cost, $1 per unit. Break-even point — 75 units.

## SHEET-METAL BOX WITH TAPERING SIDES

**MARTIN PETERSON**
Cincinnati, Ohio

Boxes that are constructed as described here are attractive and useful. The instructions will be general, and yet, any size box can be made to suit specific requirements and needs.

Read all directions carefully.

1. Obtain a drawing board, T square, and triangle to make an accurate pattern.
2. Draw the size of the bottom of the box.
3. Add the width of a side on each side of the bottom.
4. Add the width of an end on each end of the bottom.

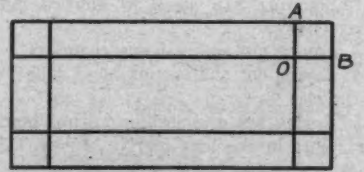



**Fig. 1**

5. At *A* and *B* lay off *AM* and *BN*, the distance that the top edge will extend beyond the bottom. See Figure 2.

NOTE: *AM* and *BN* are ⅜ in. on the layout for the box shown in Figure 3.

6. Draw lines *OM* and *ON*.

7. On the sides add enough material for a lap which will allow room for riveting. For this box it is ½ in. The line is *EF*, parallel to *MO*.

8. Add material for a folded edge. On this small box the amount is ⅛ in. More material will be required for larger boxes and for wire edges.

9. Cut the corners at *M* and *N* in such a way that when the folded edge is made, to the dotted line *CS*, corner *R* will fold to place *S*. Draw *MR* and *NR*.

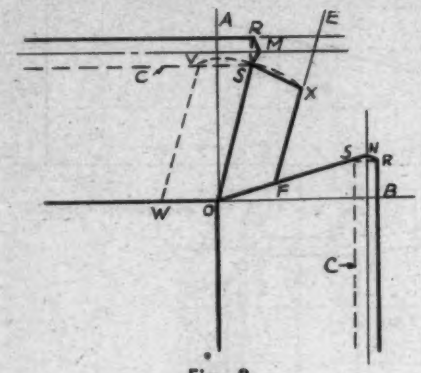



Fig. 2

10. On the side draw the dotted line *VW* where the ½-in. lap *MEOF* will fold back to.

11. With the compass point set at O and the pencil point at *V*, make the arc *V* to *X*.

12. Draw a line from *S* to *X*. Now the lap is complete.

13. Draw a duplicate of this end at the other three corners, being careful to draw all laps on the sides only.

14. Examine the pattern closely.

15. Cut along the outline.

16. Fold the pattern along its edges to make the enclosed box.

17. Unfold, and measure the width and length.

18. Measure these distances along a side and end of a piece of sheet metal.

19. Square off these with a tin snips.

20. Complete the cuts.

21. Fold the edges.

22. Bend the two sides into position.

23. Bend the two ends into position.

24. Bend the lap.

25. Punch for two rivets on each lap.

26. Fasten securely with tinned tinner's rivets.

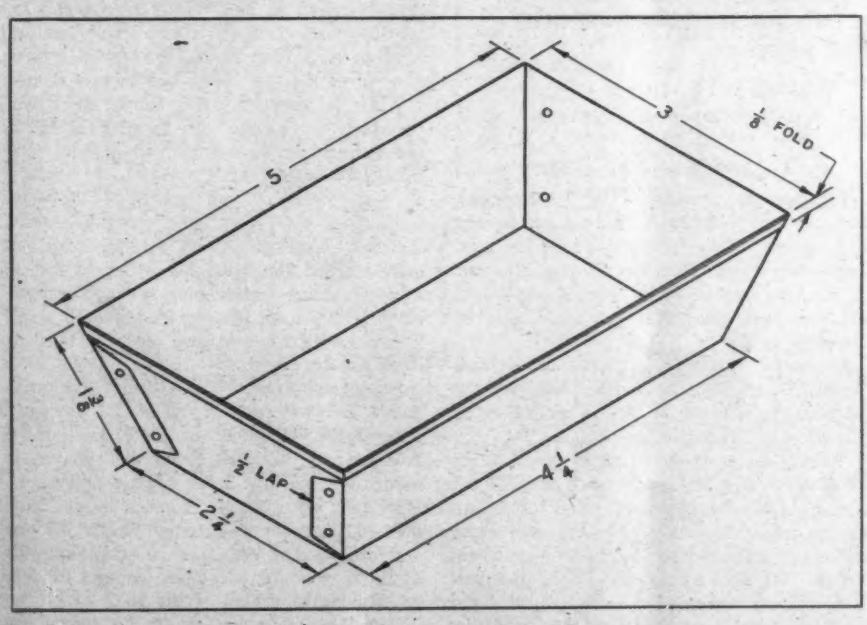


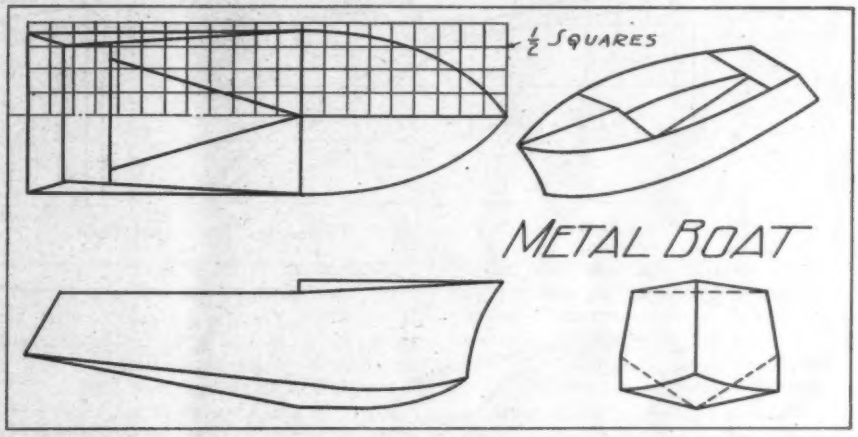

Fig. 3. Sheet-metal box with tapering sides

## METAL SPEEDBOAT

**OSCAR L. GARRISON**
Benson Polytechnic High School
Portland, Ore.

### Introduction

After the student has completed a required number of projects in the shop to acquire basic knowledge of working metal, handling tools, and soldering, we use an incentive system that we have found quite successful. The student is permitted to either bring in a job of his own special design or select one from the instructor's list. If he has some originality in the job he brings in or adds something to the one he selects, he is given credit for an extra project. This system has brought quite a number of good jobs into the shop. The most popular one chosen from the instructor's list is the speedboat described here.




### Job Sheet — Metal Boat

*Objectives:*

1. To make a boat neat and accurate.

2. Transfer patterns symmetrical about a centerline.

CAUTION: The centerline must be lined up accurately to get a true, full pattern.

3. To machine form, hand form, lap solder, and butt solder.

4. Design of motor, cabin, or both.

*General Information:* Metalworkers are often called upon to make butt seams. The one thing to watch is that the metal meets perfectly. This is not difficult if the worker is careful to tack the seam and check as he goes along.

*Specifications:*

1. Sizes are indicated on drawing.

2. Patterns are furnished according to these dimensions.

NOTE: More advanced students are required to lay out their own patterns with a slight variation in dimensions.

*Tools Needed:*

1. Snips
2. Soldering iron
3. Pliers
4. Stake
5. Hammer
6. Dolly
7. Elbow machine
8. Brake

NOTE: If your shop is not equipped with the last four, all forming can be done by hand over the sharp edge of a board. The edge around the deck can be cut down and turned with pliers.

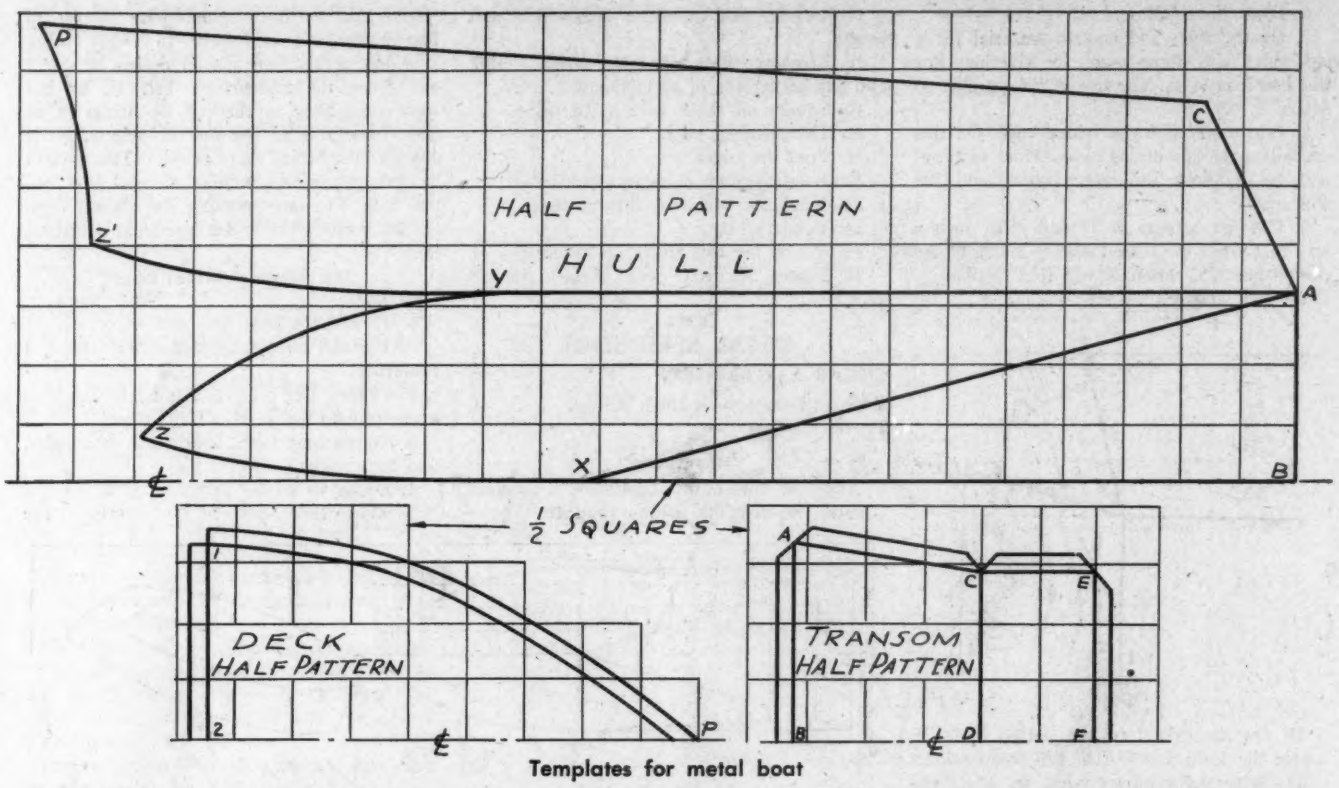
*Materials Needed:*

1. Light metal, Nos. 20 to 28-gauge galvanized iron, or, 8 by 15-in. tin.
2. Solder
3. Flux

NOTE: Tin can material may also be used.

*Procedure:*

1. Transfer the hull pattern to the metal.




**Templates for metal boat**

2. If the metal is long enough add transom pattern onto hull pattern being careful to line up points *A-B* of each pattern. If patterns are to be used separately add ¼-in. lap seam on transom pattern at line *A-B*.

3. Transfer deck pattern to metal.

4. Cut metal to exact size of patterns.

5. Place hull on support (stake or block), being careful to line up points *A* and *X* on sharp corner. Place the palm of your hand on top of the support with your fingers on the metal not supported. Apply pressure to bend the metal at about 20-deg. angle. Repeat process on other side of centerline.

6. Bend metal on line *A-Y* at right angles to surface *A-X-A*.

7. Bend *E-F* edge of transom over at 180 deg. to hem.

8. Turn *A-C* and *C-E* at 90 deg. for lap seam on hull.

9. Bend C-D at about 80 deg.

10. Draw transom up allowing to bend at *A-B* and fit angle *A-C* of hull.

11. Working from point *X* draw sides *X* up maintaining angle *A-X-Y* and tack solder in about three places. Check to see that metal is butted up perfectly. It not, correct before next step.

12. Draw or shape *Y-Z'* into point *Z*. As both sides are drawn in points *P-P* will need to be shaped out slightly to get a true fit. Tack solder along *Y-Z'*.

13. Shape gunwale to approximately deck shape. Fit *Z'-P* edge and tack solder.

14. Check all corners to see that you have a perfect butt joint from *X-Z*, *Y-Z*, and *P-Z*. If the work has been done correctly, complete the soldering.

15. Hem edge 1-2-1 of deck.

16. Turn edges 1-*P* on each side of deck. If no elbow machine is available trim off about ½ of amount given in pattern and turn edge at 90 deg. with pliers.

17. Fit deck to gunwale and solder.

NOTE: In some cases we fit and solder bulkheads in the bow and stern to give watertight compartments.

## INDIAN SILVERSMITHING

**BEN. HUNT**
**Hales Corners, Wis.**

*(Continued from page 226 of the May, 1947, issue)*

### Lapel Pins and Brooches

The lapel pins shown in Plate 7 are popular items in the Southwest trading posts. The bird designs, taken from old Pueblo pottery, seem very appropriate for the pins. Designs of this kind may be found in ethnology books for the most part, but they also may be found in books on Pueblo pottery.

No special tools are required for making these pins, because the punches used are the same as those shown on Plate 4 of this series. See page 81, February, 1947, issue.

Twenty-gauge B. & S. silver is ideal for these pins. The best and easiest way to cut them out, once they are traced or drawn on the metal, is with a jeweler's saw. From the upper left-hand sketch, Plate 8, you will notice that the cutting stroke of the saw is downward. Keep the saw perpendicular and hold the metal firmly down on the bench pin, cutting right up to the outline. On all these birds' feet you will notice that the toe from one foot touches the other foot. This has been done, because the legs are rather thin, and one leg alone would be likely to bend if caught on something.

For the benefit of those who have never done any fine jewelry sawing, drill a small hole between the bird's legs, insert one end of the saw blade through it, and fasten the saw blade in the frame. (Jeweler's saw blades should always be unclamped on one end to take the tension off the frame when the saw is not in use.) Then cut out the section, loosen one end of the saw blade, and there you are.

When no jeweler's saw is handy, the larger parts can be cut out with a small tin snips, and the rest can be cut out with a small cold chisel. Do not do this cutting on the surface of your anvil, or you will spoil the face with chisel cuts. Use some other flat piece of iron. Chisel-cut objects naturally call for quite a bit of filing, but that is the old Indian way of cutting and shaping silver. The saw-cut brooches must also be filed smooth along the outer edges, as sawing causes a burr to form on the edge.

After the blanks are cut and filed, the ornaments are stamped on them. In the very lower left-hand corner of Plate 8 is shown how to make a large round die such as is used to stamp the eyes of the upper two lapel pins on Plate 7. A piece of annealed drill rod or other steel rod is center punched and drilled. The edge can be trued up with a file if you are not lucky enough to drill exactly in the center of the rod.

The lapel pins that are to be domed are laid on the log end and hammered from the

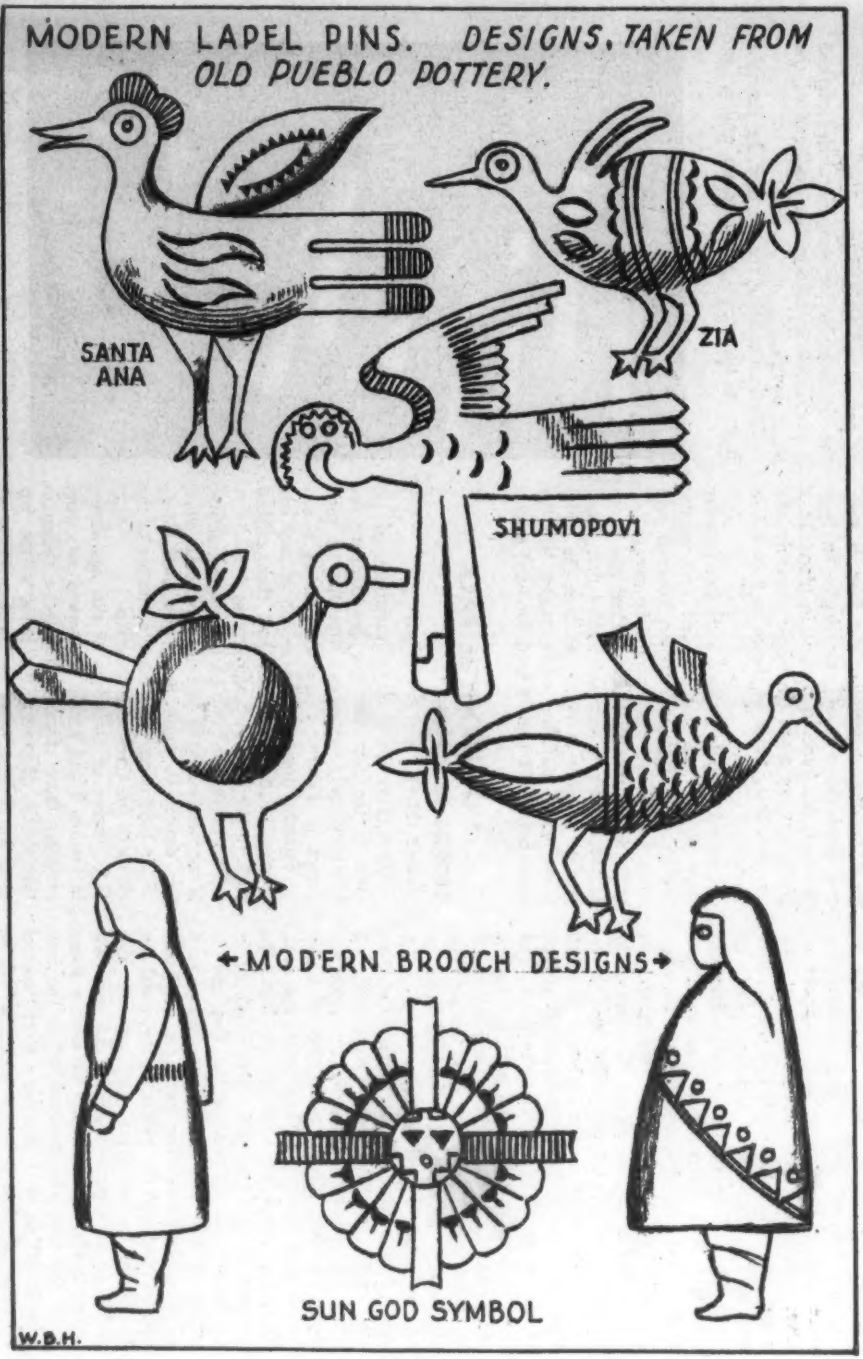



Plate 7

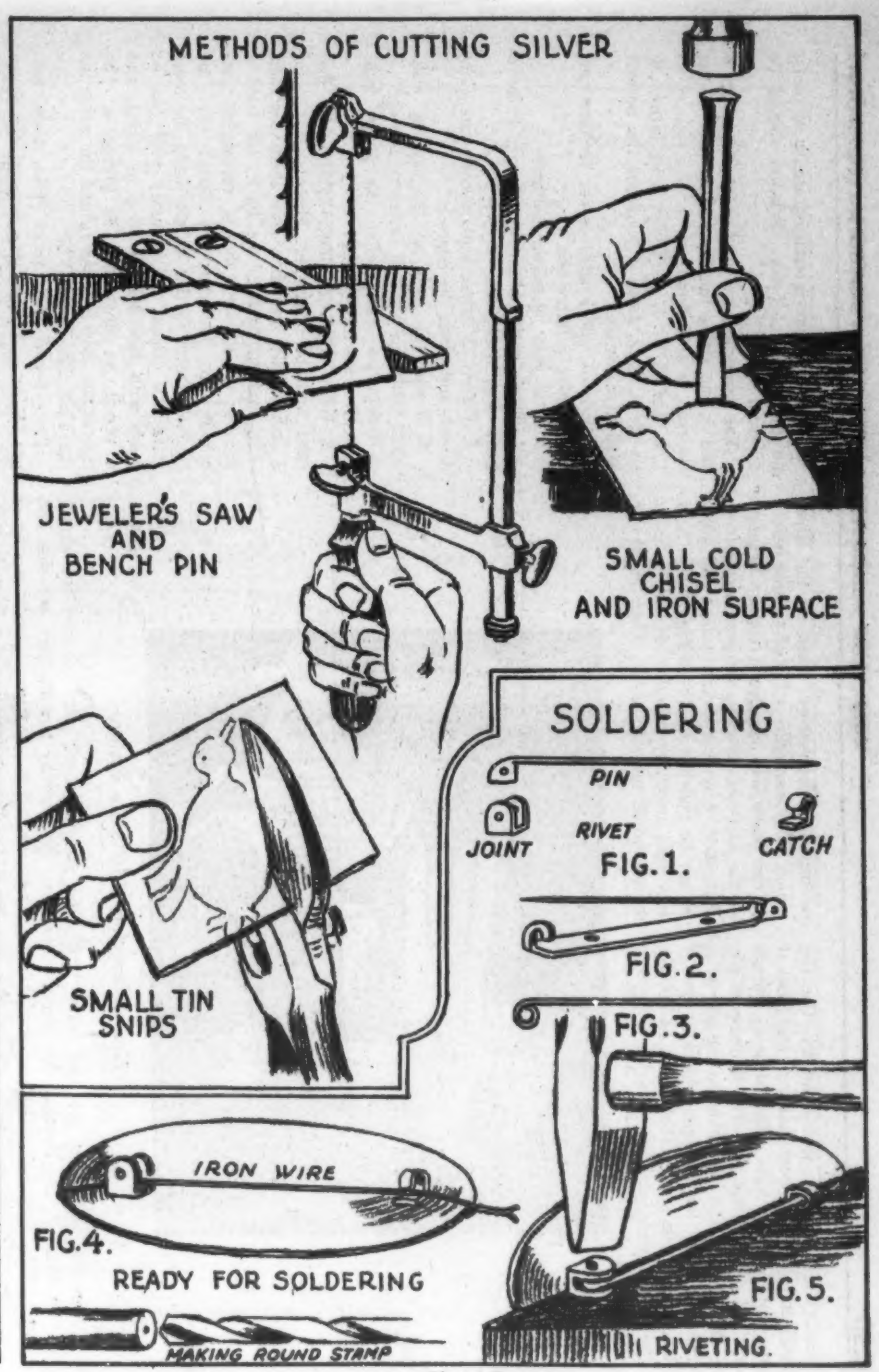
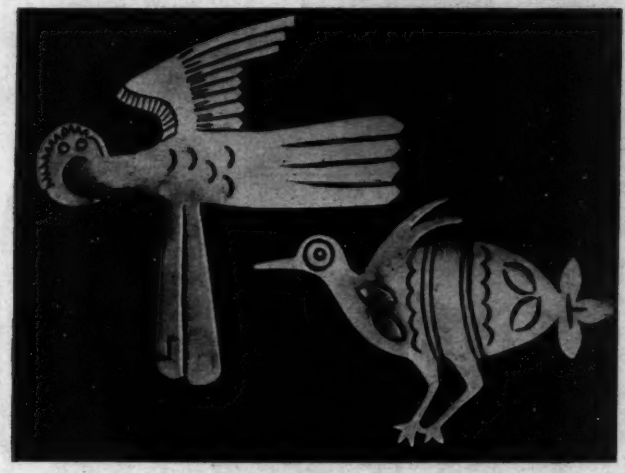



Plate 8

back. This must be done carefully. Use the ball end of a ball-peen hammer and take it easy or you will have a lot of small bumps instead of one large one. The Shumopovi pin is left flat but the one below to the left of it can be domed on a dapping block if one is handy. The sun-god symbol is flat except for the center circle.



Pins embodying old Pueblo designs

When you glance at the two lower bird pins in Plate 7, the thought that occurs to most is that they both take pieces of silver that are quite large. This may be true if they are cut out just as they appear. But these pins may be made out of pieces of silver obtained from the scrap box. The wings, the bodies, the head, and the feathers may all be cut out of separate pieces of scrap silver. They are cut to shape first and then laid on a charcoal block, soldered, and filed smooth. Silver costs money, but when you once get the knack of soldering, you can utilize a lot of pieces that ordinarily would be melted over and rolled into sheets.

Next we come to the fasteners or pins. Figure 1, Plate 8, shows the conventional type of pin which is bought in three parts. The rivet is merely a piece of wire cut to the proper length. To solder this assembly, proceed as shown in the lower left-hand corner. The pin is left off until after the soldering so as not to heat it and anneal or soften it. A piece of iron wire running through the joint and catch, as shown, will keep those two parts in the correct position for soldering. Apply the flux, place a small piece of solder beside each part, and then apply the heat. After the pieces are soldered, the iron wire is removed and the silver pin is placed in the pickle jar to remove the flux and to whiten or clean the metal. There are two ways of using the pickle. The metal can be heated and dropped into the pickle, or the metal can be placed in the pyrex pan, covered with pickle (3 or 4 parts water to one part sulphuric acid), and the pan set over a flame until the metal becomes white. If the iron wire is left on or if you use a steel tweezers on silver while it is in the pickle, a reddish or brownish deposit will form on the silver which will cause quite a bit of trouble before it can be buffed off. Use a copper tweezers or one made of wood to remove objects from the pickle. After the metal is clean and white it can be polished on the buffing wheel if it has been smoothly rounded. If not, it must be smoothed up with a file. Then insert the pin and the short piece of wire and gently rivet the wire by tapping first one side and then the other. Indians sometimes use a piece of wire longer than the joint is wide and bend the wire at right angles on both sides of the joint to hold it in place. In a pinch you can make the whole assembly, the pin then being made as shown in Figure 3 in Plate 8.

Figure 2 in Plate 8 shows a cheaper fastener such as is used for wooden and plastic jewelry. This type of fastener, however, will work out nicely, but it should be sweated on with 50-50 tinner's solder. Coat the back of the silver pin with soft solder first. Then set the fastener in place and heat the metal from below until the solder melts. Use the same borax flux that is used for hard solder.

## EXTENSION TIE RACK

GEORGE N. WELCH
Nunda, N. Y.

There have been many variations of tie racks in the past, but few can compare for efficiency and eye appeal with the tie rack shown in Figures 1 and 2. This rack can be extended for instant selection of any one of the 14 ties it holds, and then pushed back to the wall for compactness.

This project, in addition to being attractive, is very well suited to quantity production when jigs similar to those shown are used. Most of the boys in my shop made a number of the tie racks for Christmas presents.

A number of variations of the jigs shown in Figures 3 and 4 may be worked out, some probably more efficient than those shown in this article. However, the holes in the jigs used for drilling must be accurately spaced. In order to secure interchangeability of parts, no more than 1/64-in. variation should be allowed.

The procedure we used in making parts 4 and 5, the strips for the folding part of the tie rack, is as follows:

1. Rip ¼ by 1, or ¼ by ¾-in. strips, 36 to 48 in. long, from a plank of the desired kind of hardwood.
2. Cut to 5-in. lengths on the circular saw, or by using a miter box.
3. Drill with jig shown in Figure 3.
4. Plane both sides. See Figure 4 for a method of doing this.
5. Fasten 12 strips together with two ⅜-in. dowels and plane the edges.
6. Round the ends on the sanding disk, while the strips are still fastened together.
7. Separate and shellac the strips individually with thin shellac.
8. When dry, rub down lightly with fine steel wool or sandpaper. Make parts 2 and 3 individually and then glue them together.

In making part 1, the back, we tried a number of different shapes, rectangles, diamonds, etc. However, we found that the oval as shown in this article made the most attractive design. An accurate oval can be made with two nails, a loop of string, and a pencil, as illustrated in Figure 4. The tighter the loop is made around the nails, the narrower the oval will be.

Parts 6 and 7, made of ⅜-in. dowel rod, are 3½ in. and ⅞ in. long respectively. Seven of part 6 and four of part 7 are needed for the tie rack. Notice that the circles marked *s* in Figure 2 indicate the positions of the short dowels.

When assembling the tie rack, be sure the holes in the strips are lined up exactly be-

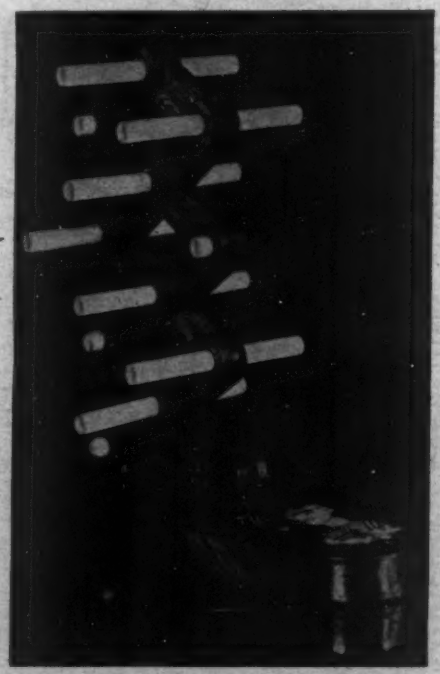
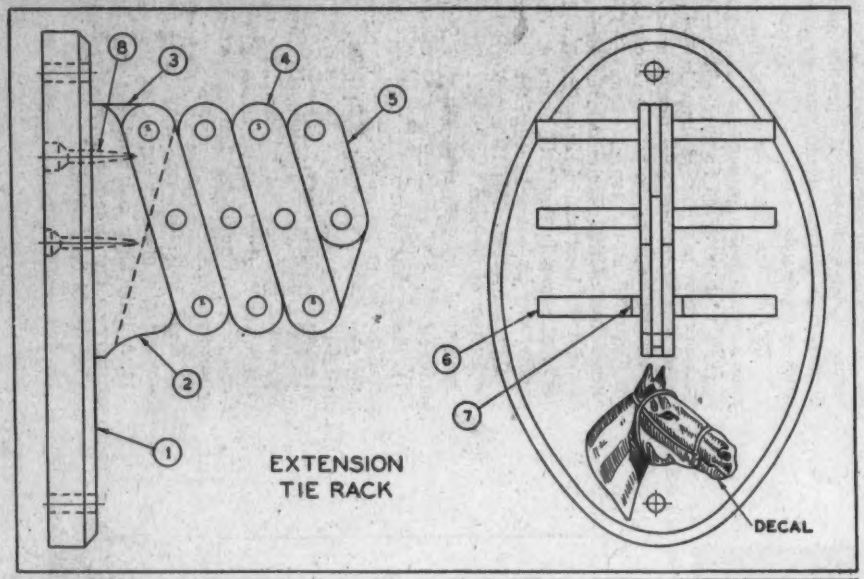
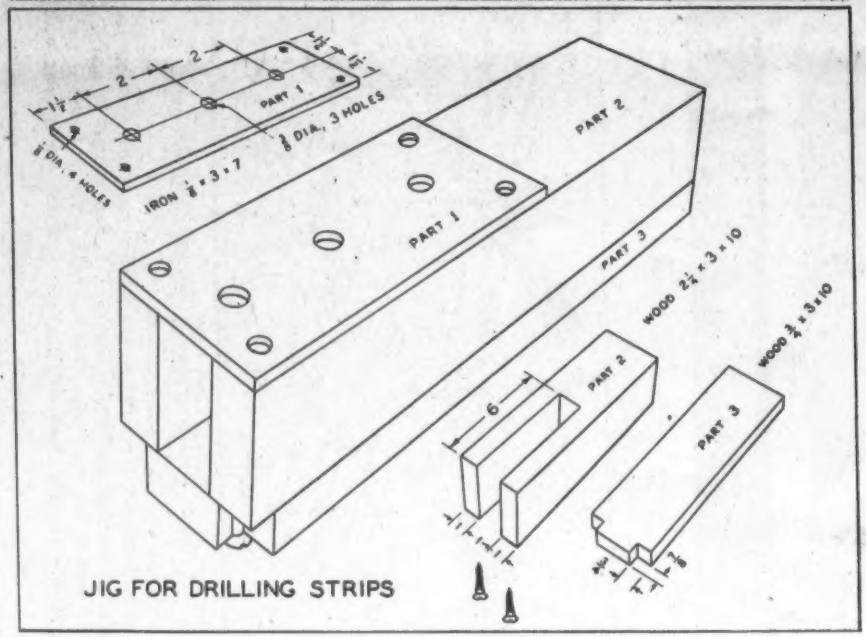


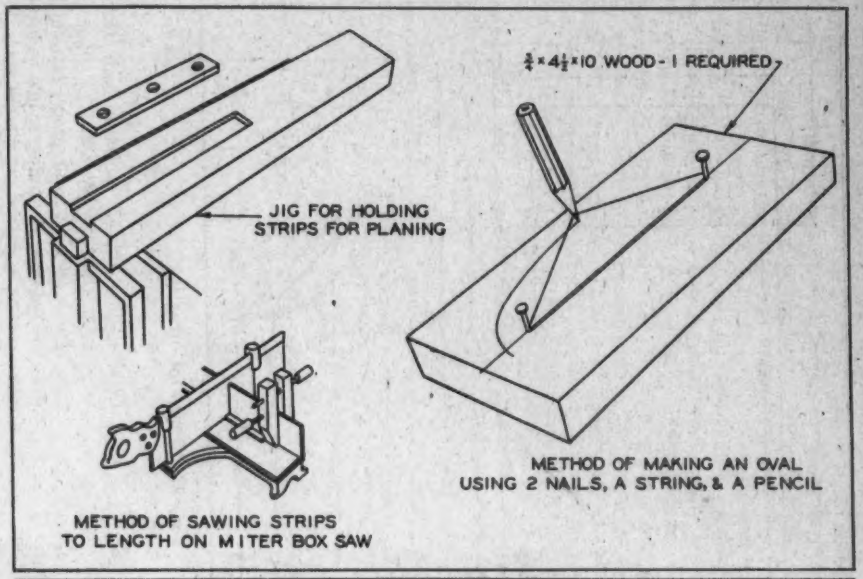
Fig. 1. The extension tie rack



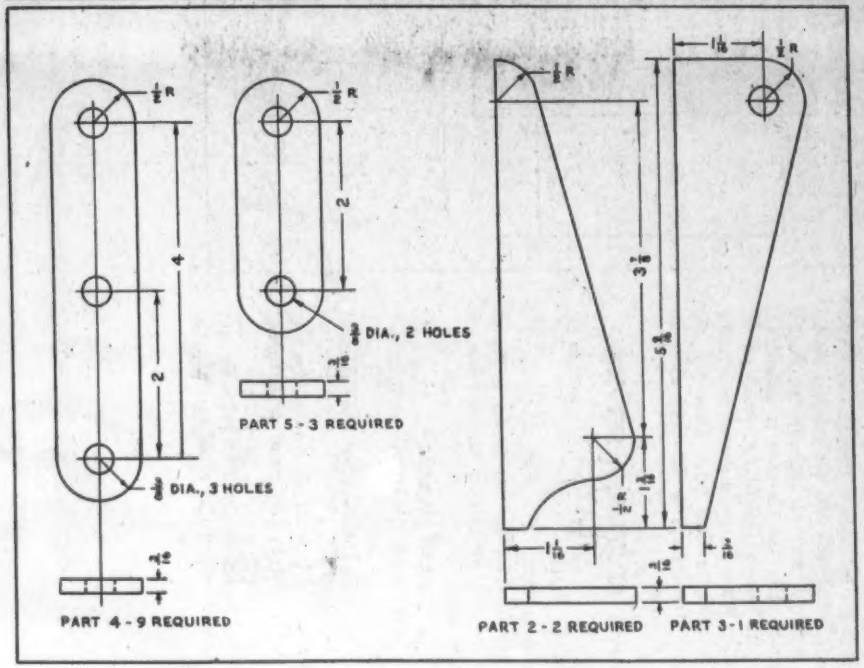

(Top) Fig. 2. Assembly of extension tie rack




(Lower) Fig. 3. Drill jig for producing the strips


JIG FOR HOLDING
STRIPS FOR PLANING
METHOD OF SAWING STRIPS
TO LENGTH ON MITER BOX SAW
3/4 x 4 1/2 x 10 WOOD - 1 REQUIRED
METHOD OF MAKING AN OVAL
USING 2 NAILS, A STRING, & A PENCIL

(Top) Fig. 4. Method of layout and for planing strips




(Lower) Fig. 5. Details of strips and support

fore tapping the dowels through with the mallet. If the dowels are not gripped tightly in the holes, it may be necessary to shellac them again after the tie rack is assembled.

For part 8, two 1¼–10 f.h. wood screws are needed. When fastening the tie rack to the back, be sure to drill pilot holes for the screws, to avoid cracking the thin, glued-up pieces of wood.

## SMALL ALUMINUM SERVICE TRAY

**HOMER C. ROSE**
Alexandria, Va.

The one-piece service tray shown in Figure 1, may be used for serving refreshments, or as a bread tray.

**BILL OF MATERIAL**

1 pc. of 16-ga. 6½ by 14½-in. aluminum.

*Procedure:*

1. Lay out outside dimensions and cut metal to size. See Figure 2.

2. Lay out details of design on drawing paper and fasten to the metal with rubber cement.

3. Make straight cuts with tin snips. Be sure to cut to end of snips to avoid marking the metal beyond the cut.

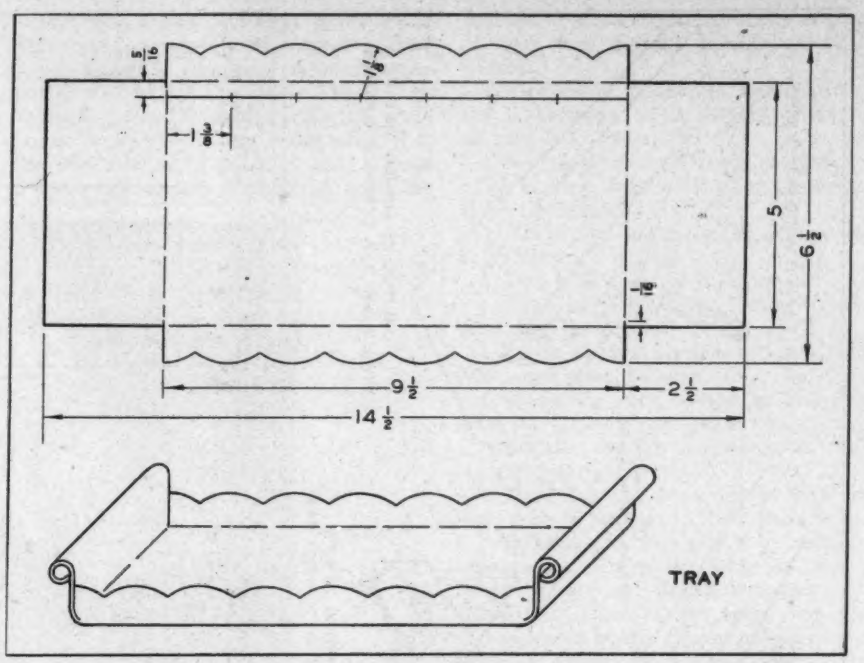



Fig. 2. Detail of tray

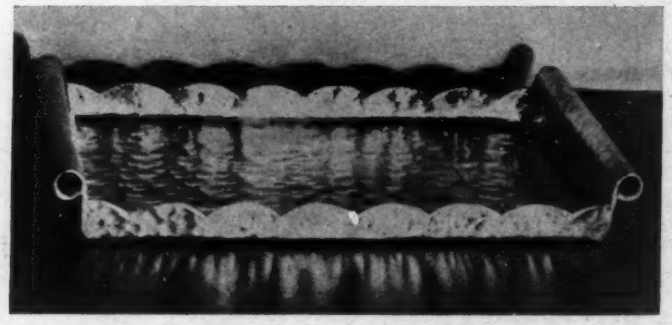


Fig. 1. Serving tray

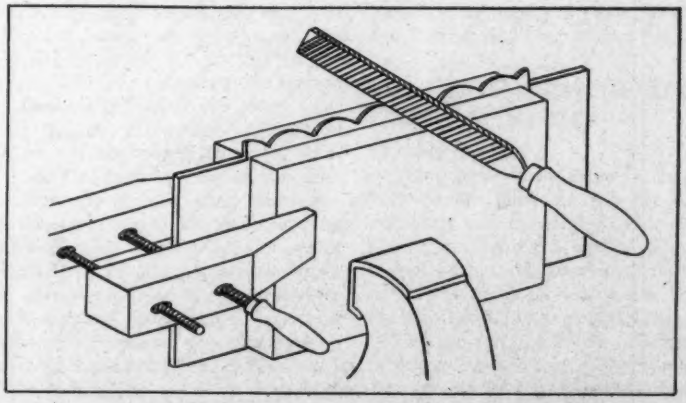


Fig. 3. Holding sheet metal for filing and bending

4. Place metal between two boards held in a vise, allowing the edge to extend about ⅜ in., as shown in Figure 3.

5. File edge to the line with aluminum file or cut with a jeweler's saw.

6. Repeat steps 4 and 5 for the second edge.

7. Finish file surfaces with single-cut file. Clean the file with file card after each stroke to prevent scratching the work.

8. Planish all over, using proper planishing stake and hammer. Precaution should be taken against using scratched or marred tools for this operation, and peening with a ball-peen hammer is not recommended. When the work is done both surfaces should show an even series of depressions.

9. To form the handles it is desirable to make a special tool consisting of a 6-in. length of ⅜-in. cold rolled rod fastened with ¼–20 machine screws to a plate as shown in Figure 4. The ends of the metal are formed around this mandrel to make the handles. The steps are illustrated at the top of Figure 4. The extreme end of the metal should be formed first and the bend should be continued with mallet as shown in step 2 in Figure 4. The mandrel may be loosened enough to slide the metal between the bar and the mandrel for the last part of the bend.

10. Cut two blocks of 1 by 4⅞ by 9⅜-in. hardwood.

11. Place these blocks of wood on the metal parallel to the lines. Clamp in place, using vise for one edge and hand screws on the sides as in Figure 3.

12. Bend sides. Form the long sides first. They must be bent past 90 deg. after the piece is removed from the vise. The metal will then spring back to 90 deg. Use leather-faced or wood mallet.

13. Bend ends to place, using the same procedure as in preceding step.

14. A little filing and planishing may be necessary on the corners, but excessive hammering should be avoided.

15. Buff all surfaces.

### Alternatives

A set of these trays may be made in graduated sizes so that they fit into each other.

If brass is used for the construction, a slightly thinner gauge of metal may be preferred. A chased or etched design may be used in place of the planished surfaces.

The tray may be made of iron, painted and trimmed with colored lacquer. If it is made of iron, the corners should be soldered. Simple designs also may be used for the lacquered tray. The development of these designs may be co-ordinated with instruction in the art department.

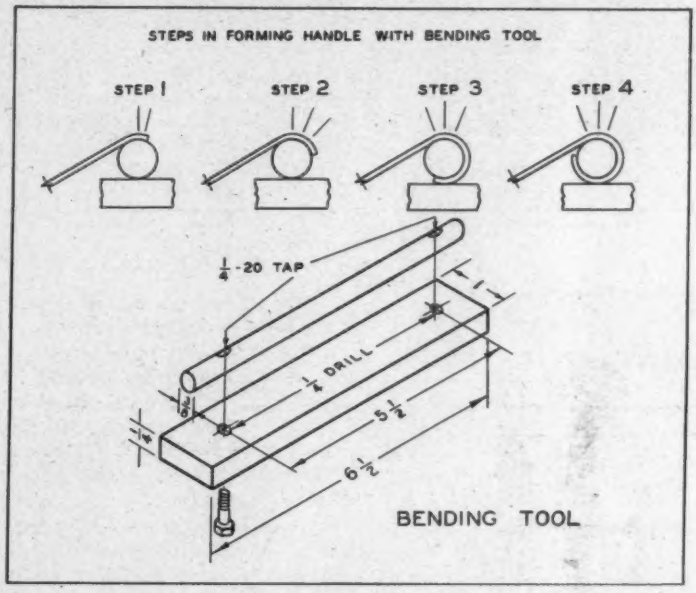



Fig. 4. Forming the handle

## ARCHITECTURE IN BIRDHOUSES

DICK HUTCHINSON
Alhambra, Calif.

The very popular birdhouse is the round birdhouse. It is well liked because it is different and attractive. However, few round birdhouses have ever been built, as the results do not compensate for all the effort entailed.

In an effort to give the readers of this magazine something that carries with it most of the lines embodied in a round birdhouse, the author has developed the one described here.

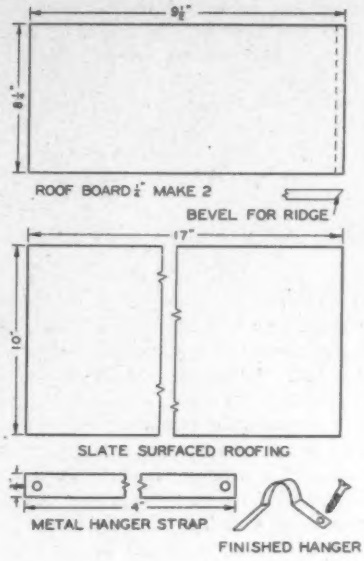
Houses of this type can be made entirely of scrap lumber. It is an interesting project, and will give the student an incentive to go on to bigger things. In addition to this, the time spent in building a few attractive birdhouses will do much to perpetuate our wild bird life.

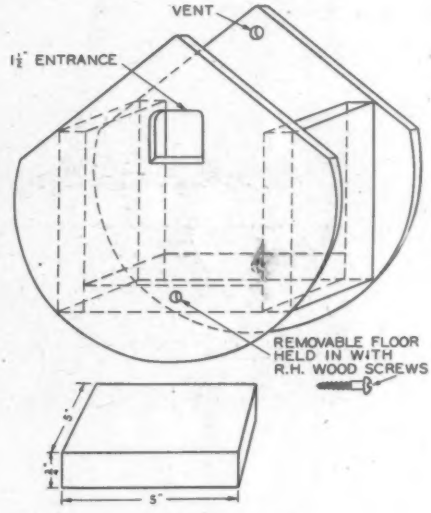
The two ends of the house shown are cut out in such a manner that when the house is completed and hung in attractive surroundings it has all the appearance of a round birdhouse, and will add charm to any scene.

This house is made from ¾-in. pine. However, ⅝ or even ½-in. material may be used with equally satisfactory results.

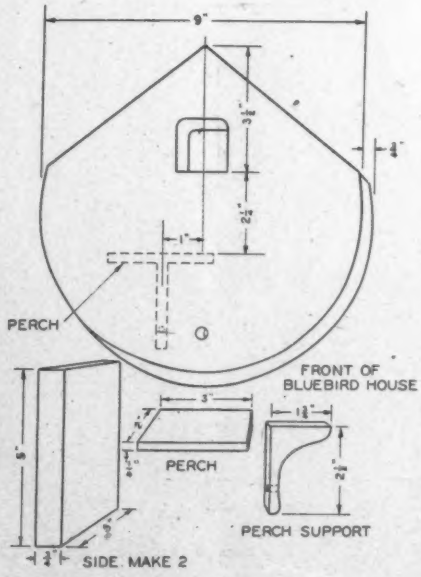
The ends are sawed out on the band saw, or with a coping saw, and are sanded smooth. The 1½-in. entrance opening may be either round or square as desired.

The nesting box is made up of three pieces, each measuring 5 by 5 in. The two sides are nailed in place between the two round ends with finishing nails, the heads are set in, and the holes filled with putty. Holes are




Detail of bluebird house




drilled through both front and back, and the removable floor is held in place with r.h. wood screws.

The shelf perch also is fastened in place with r.h. wood screws and brads.

The roof boards are of ⅜-in. stock, and are applied with brads. A piece of slate surfaced roll roofing is cut and tacked on with an overhang of about ¼ in. all around.

The metal hanger strap is cut out of soft sheet steel. It is drilled, bent to shape, and fastened on with r.h. wood screws.

Paint the house cream with a red roof, or white with a green or black roof.

The house is designed to accommodate bluebirds. However, it will attract the chicadee as well as the barn swallow. This is where the shelf perch is a *must*, for the swallow will try at first to fly in, and discovering that this

does not work out so well, he will drop onto the shelf and contemplate, and after a few attempts he will learn to fold his wings and hop in.

The same design may be used for the house wren, by reducing the diameter of the two ends to 7¾ in. The nesting space required for the wren is 4 by 4-in. floor area. The entrance opening should be ⅜ in. in diameter, and a 2-in. length of ¼-in. dowel is set in the front in place of the shelf perch.

Many bird lovers still adhere strictly to a standard set of specifications in building birdhouses. However, after working with the birds for over twenty years, the author has learned that all that is necessary in building birdhouses is to protect them against larger birds, cats, etc. Be sure that the entrance opening is far enough above a roomy nesting space so that larger birds cannot get at the birds in the house, and hang the house high enough so that prowling cats can't reach them.

Regarding painting. Bright colors will attract more birds. Try a drab house alongside of a brightly painted one and see which one is "Wren'ted" first.

The bluebird house hanging from the limb of a tree

## AN INK-BOTTLE HOLDER

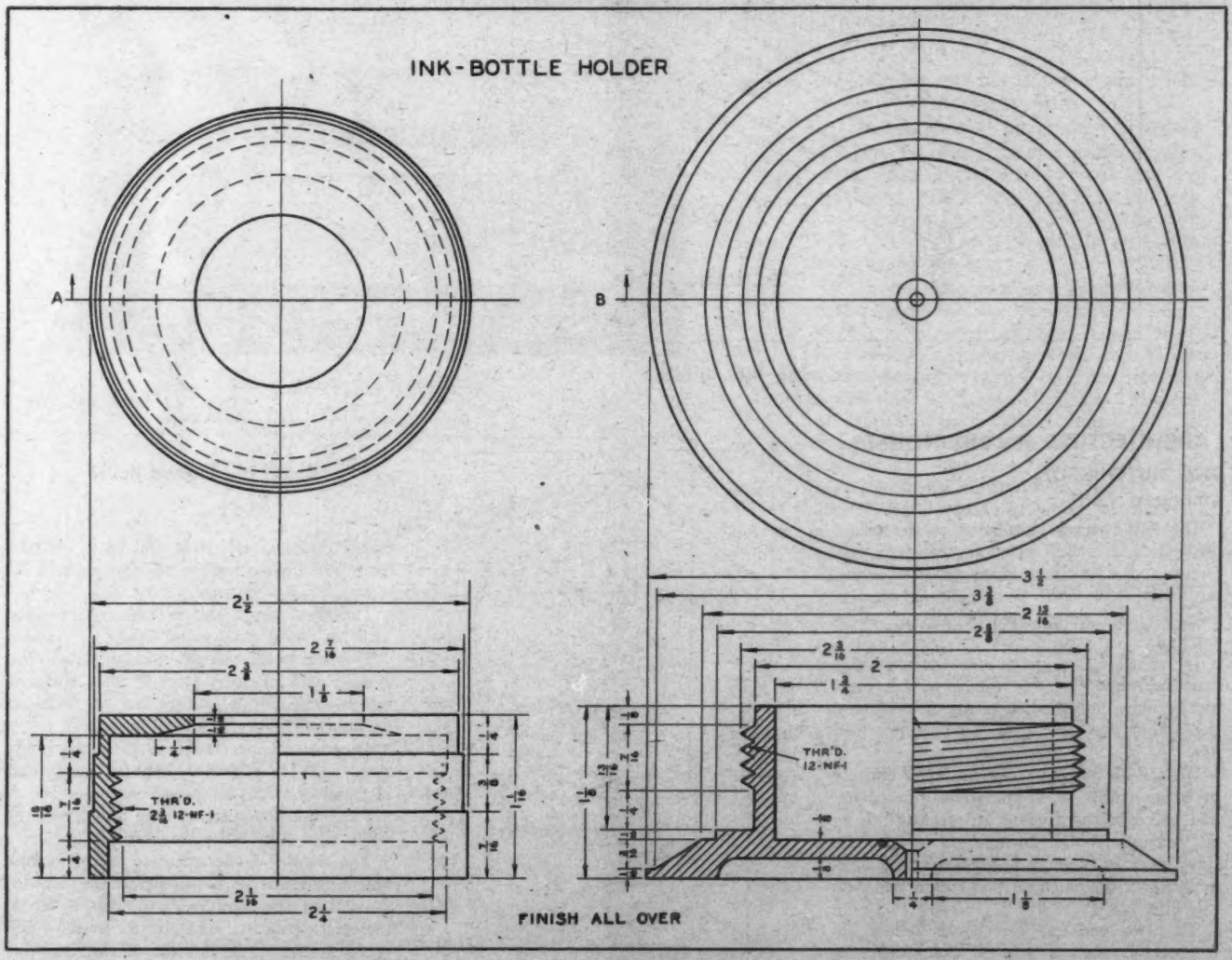
**J. HENRY SCHROEDER**
Professor of Industrial Education
Southern Illinois Normal University
Carbondale, Ill.

The ink-bottle holder is a very useful article about the desk or drawing table. It may be fastened to the table with a small flathead screw, when it is necessary to keep it permanently in place, or it can be used without fastening to a table, as its base is broad enough to prevent it from tipping and spilling the ink.

This holder is designed to hold a ¾-oz. bottle of Higgins drawing ink. If it is to be used for a bottle of a different size it is a fairly simple matter to modify the holder to fit the other ink bottle.

In addition to being a useful article it is a good project for the machine shop as the making of it involves a group of fundamental operations such as cutting internal and external screw threads, boring on a lathe, facing, taper turning, cutting shoulders, and polishing.

It also gives the student an opportunity to




Aluminum ink-bottle holder

**Ink-bottle holder**
— Photograph by Hal Stephens, instructor of geology, University of Missouri, Columbia, Mo.

learn about different materials and shop processes. If you have a melting furnace and simple molding equipment, it is easy for the student to make his own castings, thereby acquainting himself with patternmaking and foundry practice.

— Photograph by Hal Stephens, instructor of geology, University of Missouri, Columbia, Mo.

## KNICKKNACK SHELF

**G. A. MORRISON**
Public Schools
Portland, Ore.

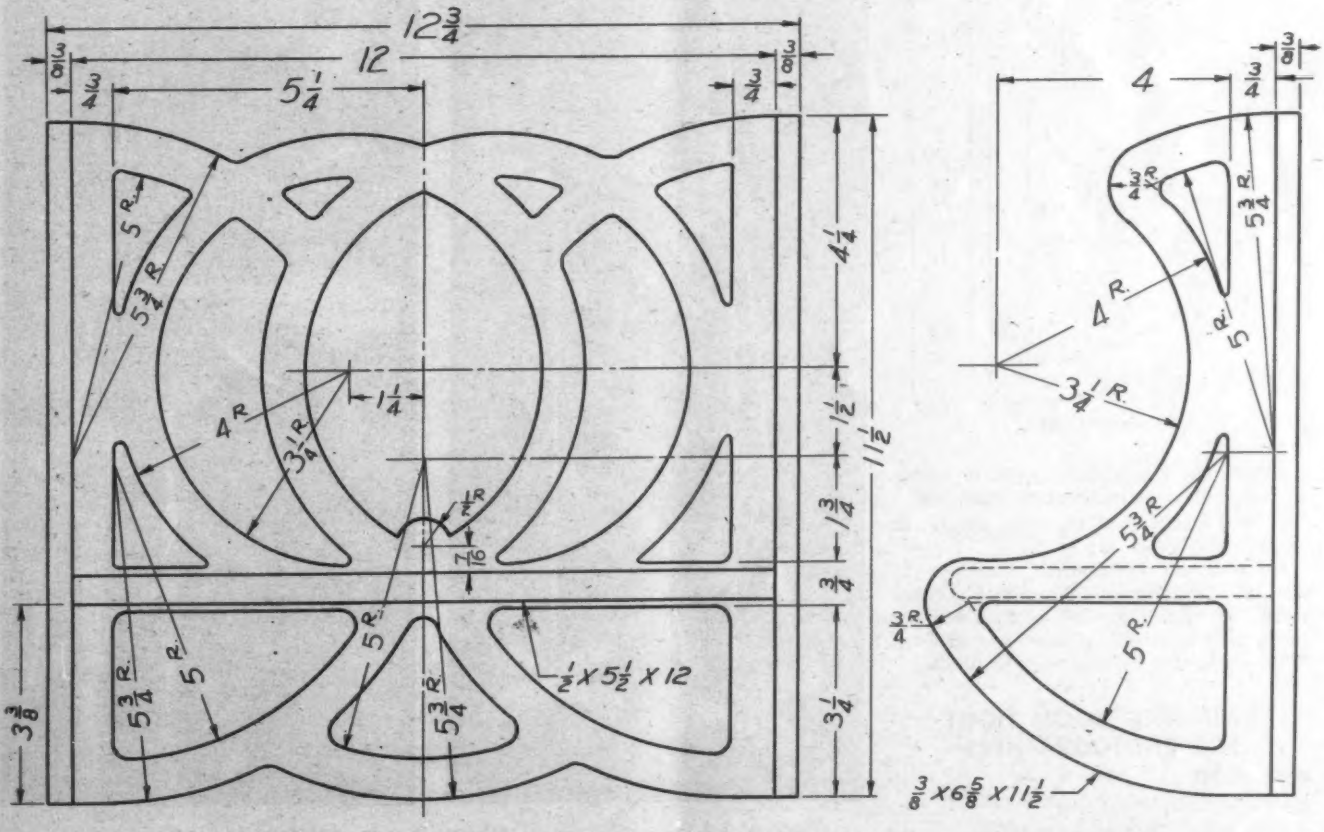
A knickknack shelf, either wall or corner type, if attractively desinged will always find a ready response in an industrial-arts class. The design shown here has been quite successful with eighth-grade students. Most designs are difficult for the average boy to copy as they are made up of freehand curves. This shelf is drawn entirely with compass curves and straight lines, which eliminates the necessity of first drawing patterns, and may be drawn directly on the wood. Caution: Be sure to add the thickness of the wood to back edge of one side of corner shelf, and to both sides of wall shelf. The sides and back of this shelf were made of ⅜-in. material and the shelf of ½ in.

**Bill of Material for Wall Shelf**

| *No. of pcs.* | *Material* | *Size* |
|---|---|---|
| 1 | Plywood | ⅜ x 12 x 11½ in. |
| 2 | Plywood | ⅜ x 6⅝ x 11½ in. |
| 1 | Plywood | ½ x 5½ x 12 in. |

**Bill of Material for Corner Shelf**

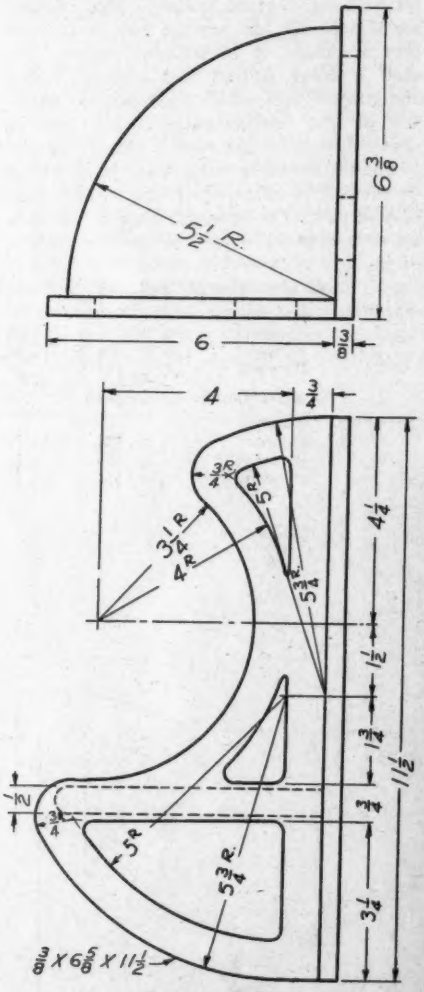
| *No. of pcs.* | *Material* | *Size* |
|---|---|---|
| 1 | Plywood | ⅜ x 6¼ x 11½ in. |
| 1 | Plywood | ⅜ x 6⅝ x 11½ in. |
| 1 | Plywood | ½ x 5½ x 5½ in. |




Wall shelf for knickknacks

*Procedure:*

1. Draw horizontal and vertical center lines on back panel.
2. Draw curves from points indicated on working drawing.
3. Draw all lines lightly at first, then go over them again.
4. Drill small holes in cutouts for insertion of coping saw blades.




Corner shelf

5. True any irregularities caused in sawing with wood file, then smooth with sandpaper.
6. Sand face side of all pieces and fasten together with 1¼-in. brads.
7. Finish with three coats of enamel, or the shelf may be stained and three coats of either shellac or varnish applied, sanding well between coats with triple O paper or steel wool. Allow ample time between coats for drying.

## SWINGING BOOM LIGHT FOR PHOTOGRAPHERS

**BEN. HUNT**
Hales Corners, Wis.

How often, when photographing small objects, one wishes for a light than can be placed above the object at a height not to be reached with an ordinary light stand. The stand shown in Figures 1 and 2 can be built easily of scrap material, and can be adjusted to any angle and to a height of 9 ft. The upright is a piece of ¾-in. pipe, 45 in. long. The upper end is heated and flattened and the lower end threaded so it can be screwed into a flange. See Figure 1. The disks were made of 3/16-in. aluminum. Four 3 1/3-in. disks are cut. Two of them have a 7/16-in. section cut out, as shown, for the ⅛-in. pipe, which has an outside diameter of approximately 13/32 in. Only the smaller section need be riveted to the solid disk, the other longer section being held in place by a carriage bolt with wing nut which locks the disks in position. Wood disks of maple or birch can be used if no metal is available. These also are shown in Figure 1. The base of the swinging boom light was made of maple. Any other 2 by 4-in. material could have been used as well. The base should be rather heavy to compensate for the boom when extended. The four screws going through the flange can also be used to fasten the two base pieces together. The reflector swivel is taken from a regular reflector. The wire spring clip is removed, and the clamp which held the spring clip is straightened to fit the ⅛-in. pipe.

One of the good features of this light stand is the fact that the light cord can be run through the ⅛-in. pipe. See Figure 2. The two hooks, fastened about 15 or 16 in. apart on the upright pipe, act as supports for the light cord when not in use. This eliminates the tangled and twisted cord which is always slipping down from the reflector around which it is ordinarily wrapped. The lead weight on the end of the boom helps counterbalance it. It may be cast directly on the boom. A discarded tooth powder tin may be used for a mold, by wiring the end of the pipe to keep it centered in the can. The can should then be removed after the lead has cooled. When the entire swinging boom has been finished give it a coat of aluminum paint. Figure 2 shows the entire assembly. It also shows a regular adjustable light bracket base which can be made readily out of a piece of ⅜-in. pipe, 42 in. long. This size of pipe measures approximately 11/16 in. on the outside, and ½ in. on the inside. This opening is slightly larger than needed for a ⅛-in. pipe, which has an outside diameter of approximately 13/32 in. To center the smaller

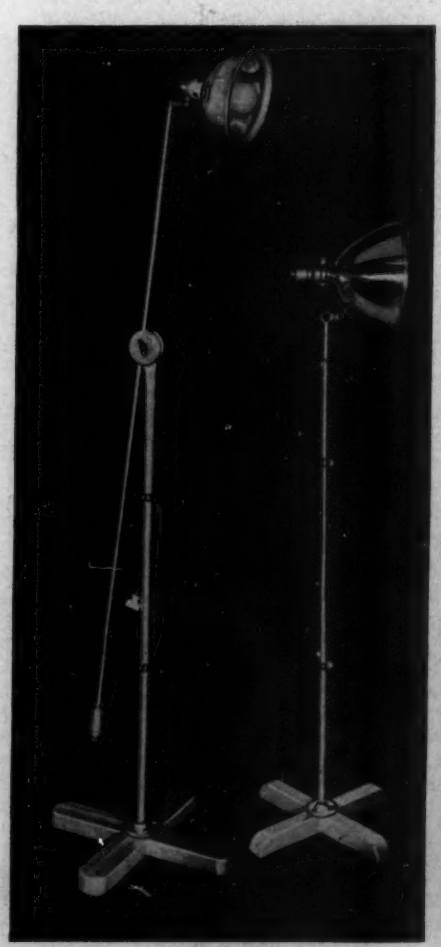


Fig. 2. Swinging boom and floor lamps

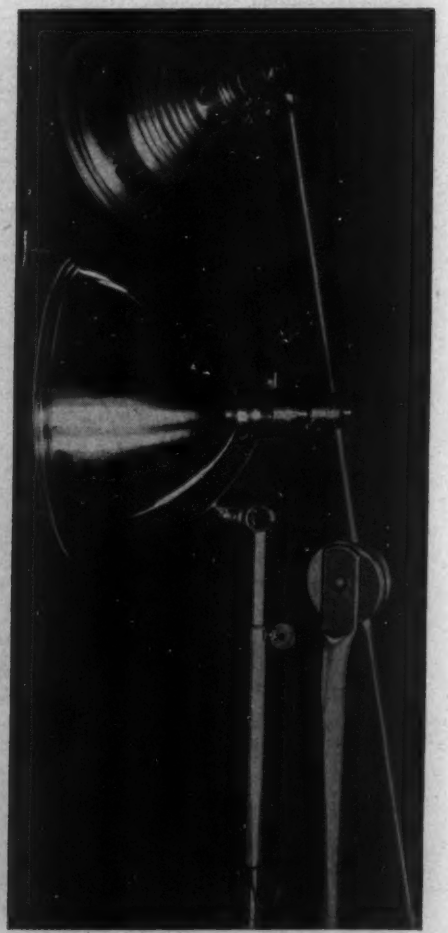


Fig. 3. Floor lamp and swinging boom lamp

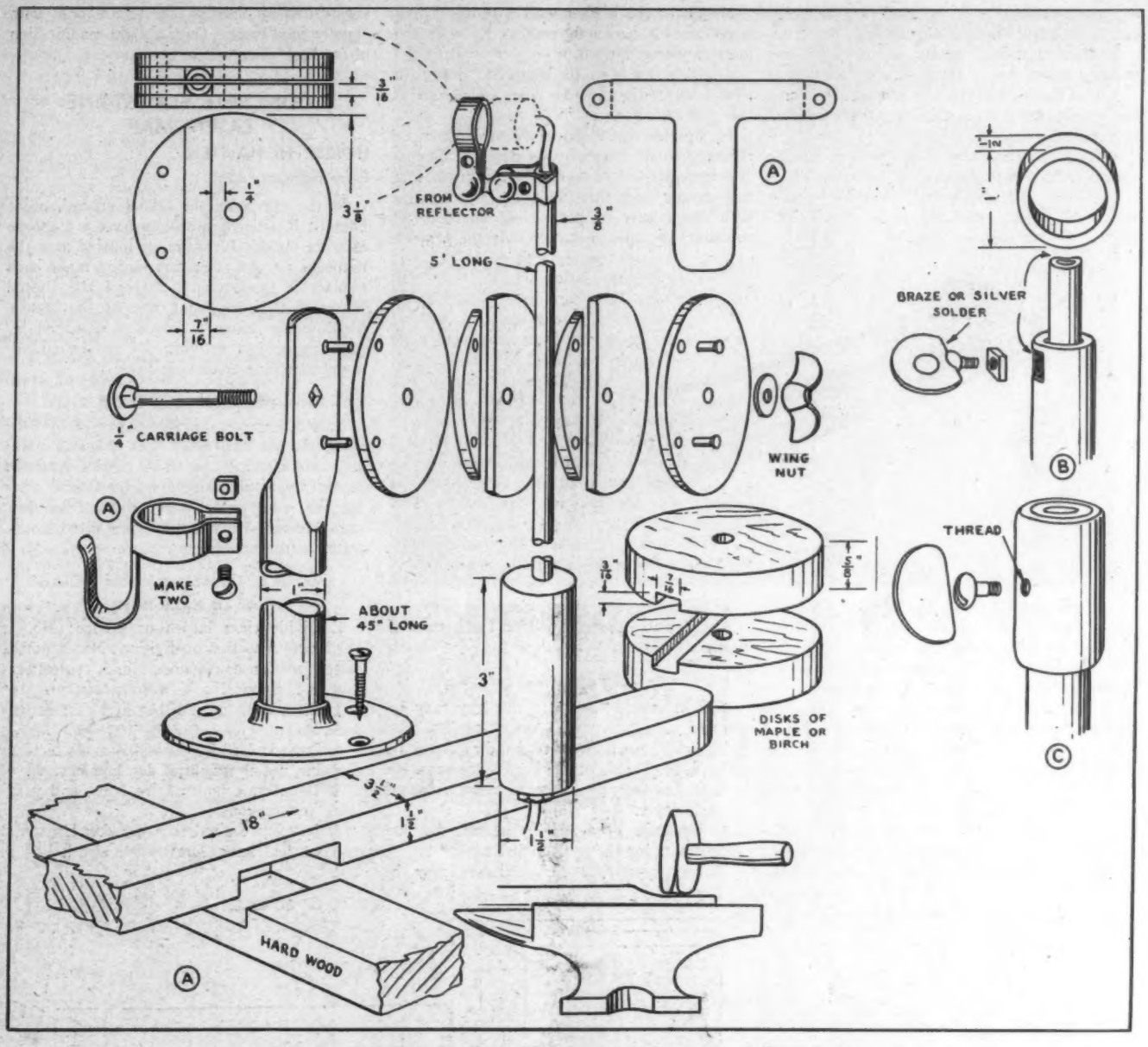



**Fig. 1. Details of adjustable swinging boom and floor lights**

pipe, it is a simple matter to flange the larger pipe slightly at the upper end. The tightening screw may be set into the large pipe in two ways. At *B* in Figure 1 is shown what to do if you have no thread cutting tap. The pipe is filed flat to fit a stove bolt nut and a larger hole than the bolt is drilled in the center of this flat section. The bolt is then brazed or silver soldered in place. If you have a tap and a pipe that is threaded at each end, you can screw a coupling on, drill and tap it to fit the stove bolt, and you are all set. See *C* in Figure 1.

To take the place of the usual knurled bolt, a washer or any piece of metal can be hard soldered (brazed or silver soldered) into the slot of the stove bolt as shown at B in Figure 1. To the upper end of the small pipe a permanent light bracket and reflector is attached. The ring is a section of pipe measuring 1 in., which is slightly smaller than the twist in the ordinary reflector spring clip. The ball joint is fastened to this ring, and the ring is hard soldered to the pipe end. The base for this light stand can be somewhat smaller than the one used for the boom stand. Two pieces of 1½ by 1½ by 16-in. oak will be found quite satisfactory. With the hooks for the cord, this makes a very efficient and serviceable light bracket. A coat of aluminum paint finishes it up. It can be raised to about 7½ ft. For home use, the fixed base is more desirable, even though it takes up a little storage space, and being flat on the floor, it is not so likely to be kicked over as the tripod base types.

## DESK TRAY

**HOMER C. ROSE**

Alexandria, Va.

The desk tray, shown in Figure 1, is made out of two typewriter ribbon boxes, a piece of bright tin or galvanized iron, and a small scrap of imitation leather. The project is a practical and attractive piece for the home or office. The boxes at the ends of the tray are useful for stamps, paper slips, thumbtacks, erasers, or small change.

### Suggested Procedure

1. Obtain two matching typewriter ribbon boxes and take the measurement across the bottom. If this dimension is other than 1½

in., modification should be made in the layout of the base, shown in Figure 2.

2. Make a careful layout of the base on drawing paper.

3. Cut this pattern to size and mount it on the sheet metal with a suitable adhesive such as rubber cement.

4. Trim the metal to the pattern, being careful not to cut beyond the intersections.

5. Remove the paper and clean the metal with steel wool. Remove any burrs with smooth file or abrasive cloth.

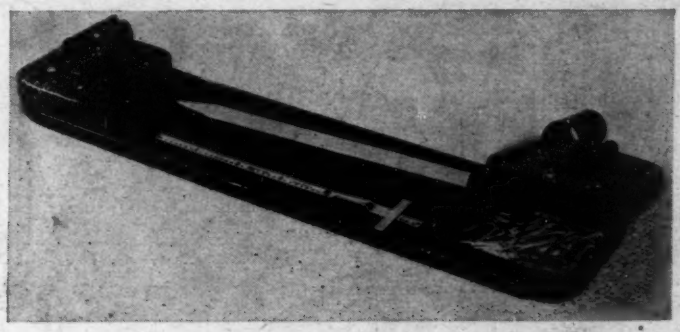


Fig. 1. Desk tray

6. Fold the edges of the base to form a cross section as indicated at Section *A-A*. A piece of scrap metal 3½-in. in width may be folded up first as a practice piece. The section at *A-A* must fit the boxes snugly.

7. Cut the imitation leather to size and mount it on the base with rubber cement. The leather will extend part way under the boxes when the pieces are assembled.

8. Place the boxes in position and solder along the exposed edges of the base.

9. Cut the material for the scrolls to size and form the scrolls around a suitable stake.

10. Sweat solder the scrolls to the covers.

11. Cover the leather with a snugly fitting piece of stiff paper to protect it while the finish is being applied.

12. Clean the piece thoroughly all over with steel wool and apply two coats of enamel in the desired color.

13. Spatter the enamel with a complimentary color. This may be done by dipping the extreme end of a small stiff brush into the enamel and then snapping the bristles with the fingers or a scrap of sheet metal to cause the paint to spatter over the project.

14. Remove the paper from the tray.

15. Mount a piece of felt on the bottom if desired.

### Alternatives

The imitation leather in the tray may be omitted.

Many different types of handles could be used on the covers of the boxes. For example, a large ball bearing could be sweat soldered to each cover.

Crystallizing or a wrinkle enamel may be substituted for the spatter finish.

Round typewriter ribbon boxes may be substituted in place of the square ones with equally good results. Only a slight modification of the base piece will be necessary.

## CONCRETE FLAGSTONE LAWN MAP

**HOMER H. HAISTEN**
Birmingham, Ala.

At the camp, on the school ground, or at home it is often desirable to have a flagstone area for outside furniture, or located near the barbecue pit. An attractive way to make such a place is to develop a map of the United States, each state being one of the stones. Molding the states in concrete offers an interesting project and will not run into hard-to-get materials or excessive cost.

### Materials and Tools

United States map, craft paper (2 by 2-ft. squares), red and black wax crayons, yardstick, metal strips 2 by 40 in., pallets, sand and cement, nails, pipe nipples ⅜ by 1½ in., mixing box, steel trowel, wooden float, hammer, ramming rod, scaled map of the United States, team assignment sheets.

### Details of Construction for a Class of 16 to 20 Boys

1. Divide class into four groups: No. 1, southeastern section or division; No. 2, northeastern section or division; No. 3, central section or division; No. 4, western section.

2. Elect captains. Fill out and post assignment sheets.

3. Issue United States scaled maps to team captains, noting graphical development.

4. Issue craft paper 2 by 2 ft., and yardstick and crayons.

5. Develop desired size, drawing horizontal and vertical lines. Draw each eighth line in red.

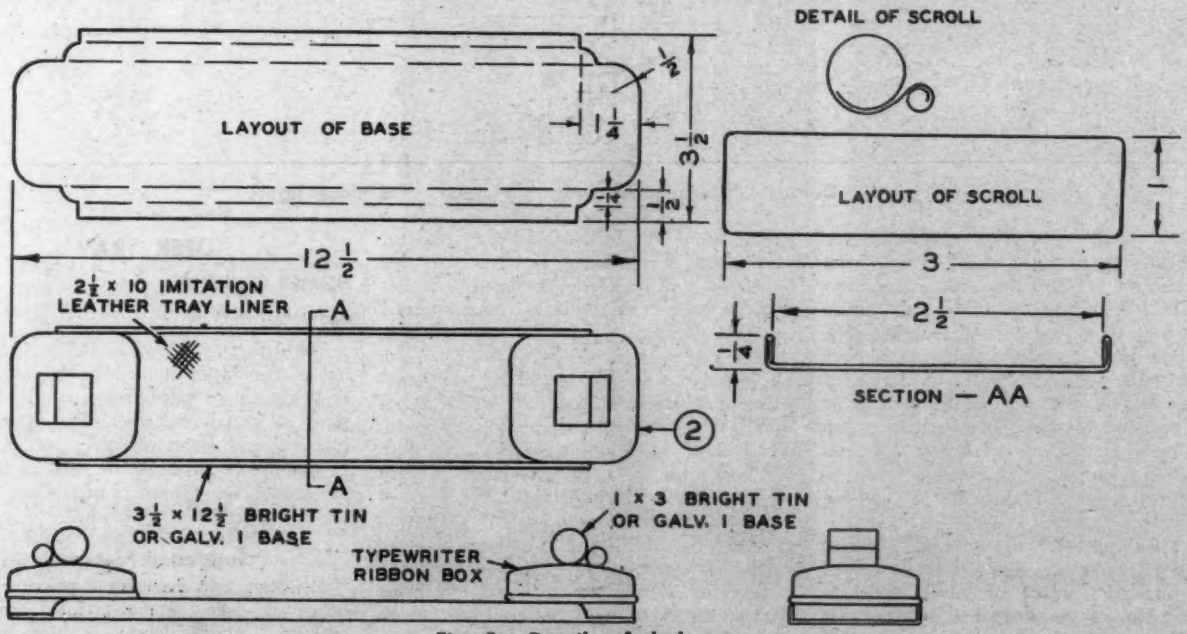



Fig. 2. Details of desk tray

6. Outline state boundaries from United States scaled map. See Figure 1, Virginia, No. 11, Division 1.

7. Cut out worker's pattern. Locate Capitol as shown at 2 in Figure 1.

8. Complete all states in each division. Assemble on floor for scale and for fitting.

9. Shape galvanized iron strips to pattern.

10. Secure strips with nails to pallet for molding as shown at 3 in Figure 1.

11. Put two parts of sand to one part of cement in mixing box; stir thoroughly.

12. Add water carefully until a smooth, plastic, workable mass is obtained.

13. Fill mold with mixture. Rod until mold is full to the top.

14. Finish surface. For smoothing use steel trowel. For walk finish use wood float.

15. Place pipe nipple in position locating capitol. See 2 in Figure 1.

16. Let stand until firm. Cut name of state if desired.

17. When hardened, remove nails and metal strips from around mold.

18. Store in cool, moist place. Record completed state on assignment sheet.

19. Prepare lawn by leveling and packing.

20. Assemble states by starting in center and working toward the outside.

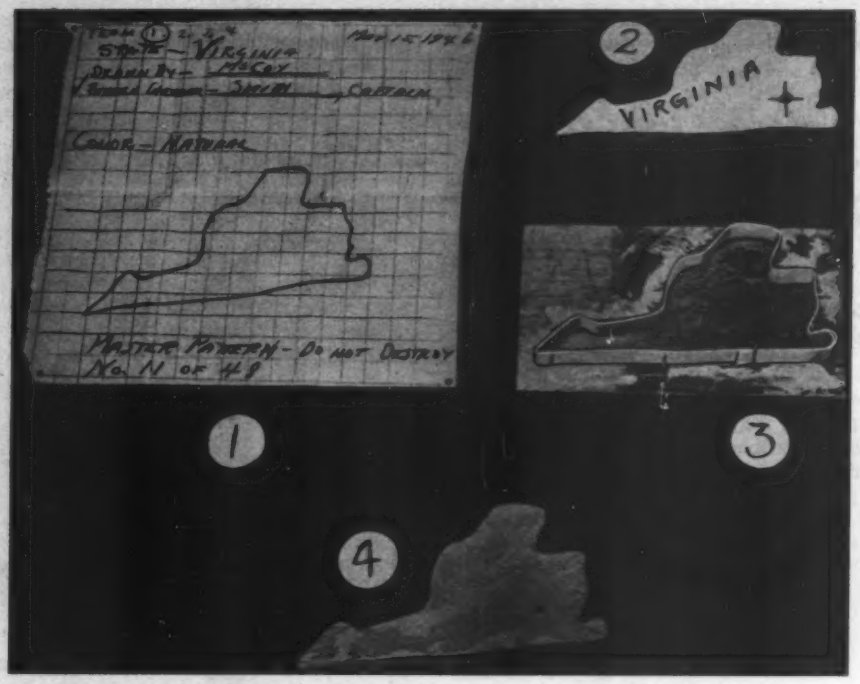



Fig. 1. Pattern, mold, and casting of the flagstone for one state

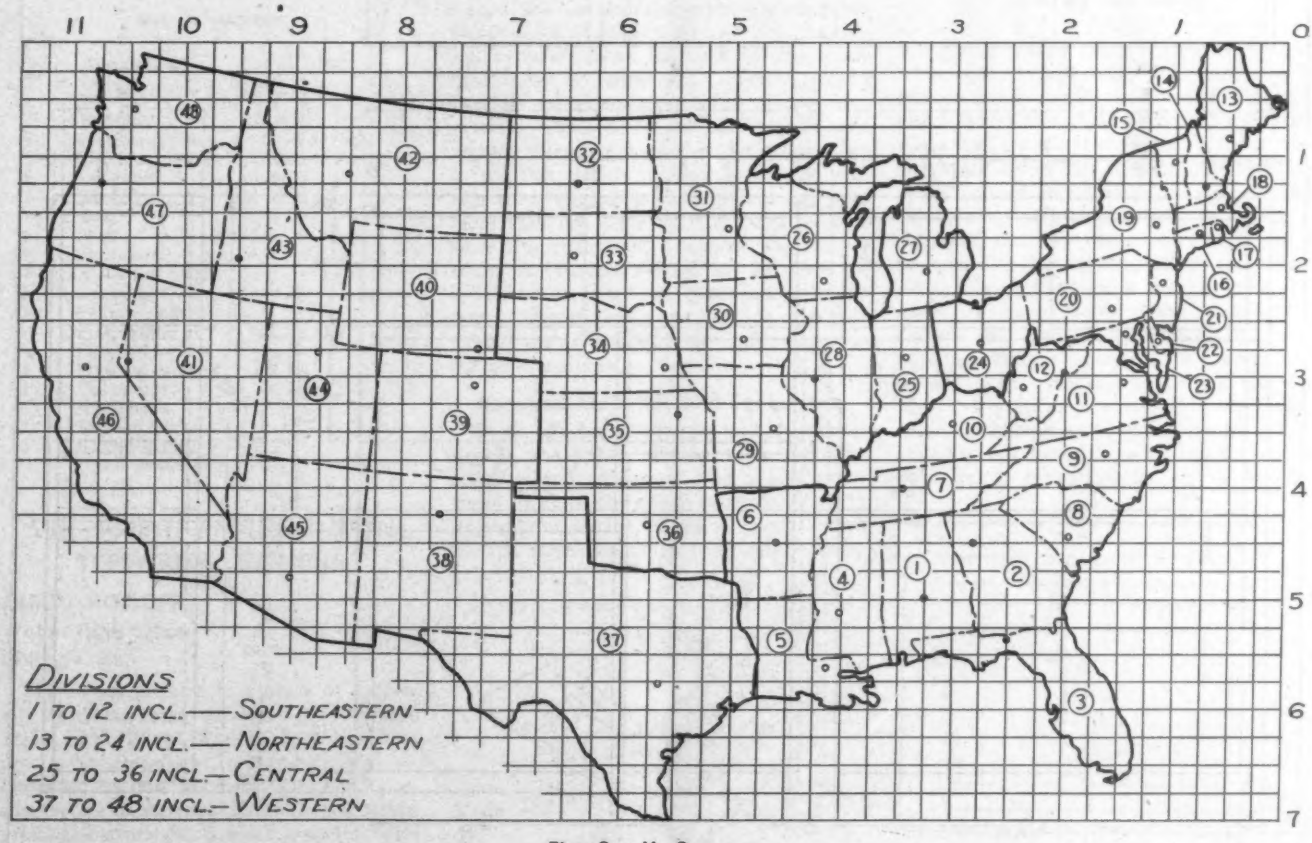



Fig. 2. U. S. map

NOTE: To make states of various colors, use white Portland cement with coloring pigments.

**References**

Portland Cement Association, Chicago, Ill. *A Practical Course in Concrete*, by Henry Geise. *Concrete Improvements Around the Home*, Second Edition.

Universal Atlas Cement Company, New York, N. Y. *Handbook of Concrete Construction*, Eighth Edition.

## TWIN-CABINET MEDICINE CHEST

**SIMON S. PALESTRANT**

Bronx, New York City

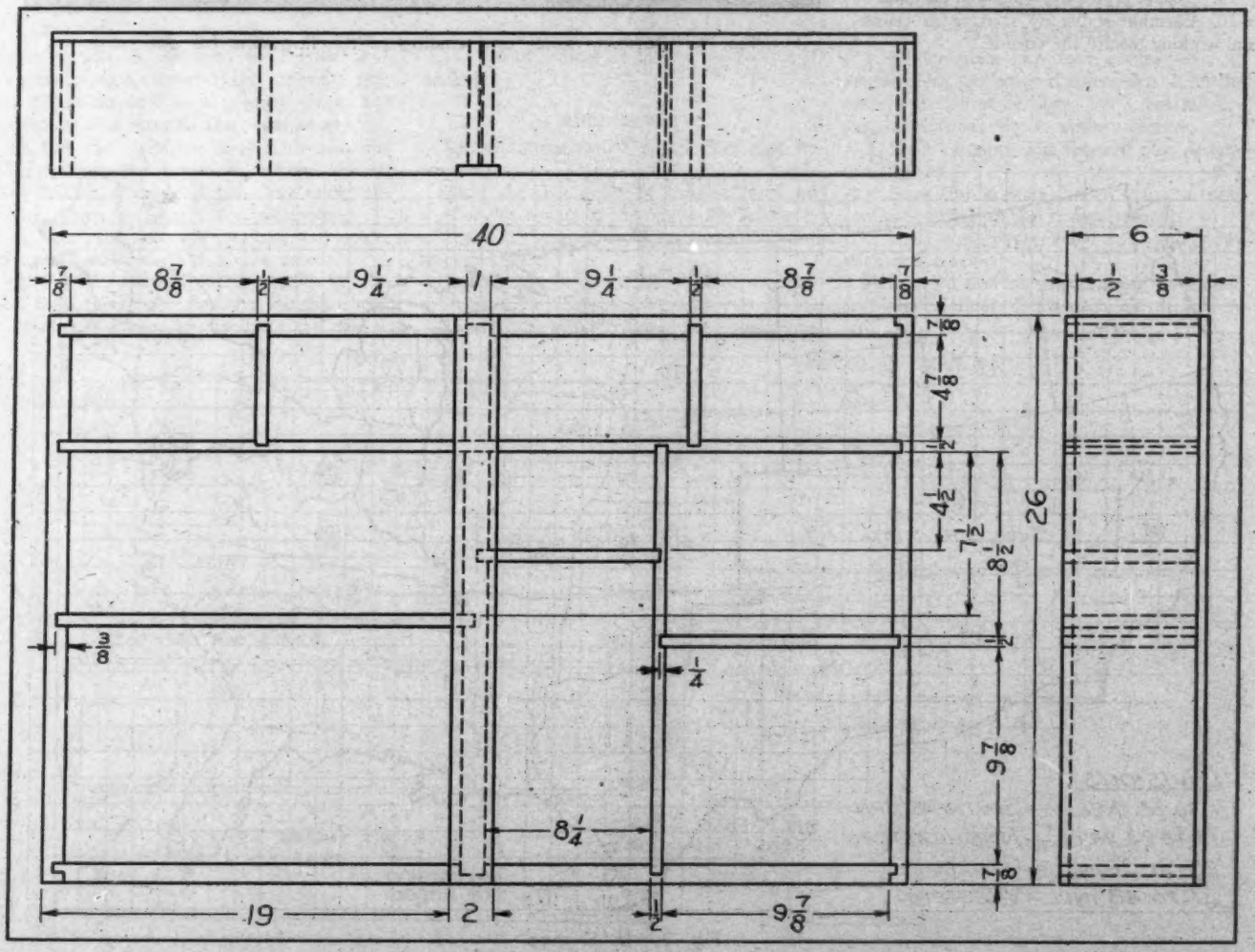
Cut all stock to size as indicated in the stock bill. Mark and cut the dado grooves as shown in the plans. We assume that the stock has been previously squared and surfaced. Sandpaper all parts and check to see that all joints fit snugly.

Assemble the job — walls, top and bottom, shelves and shelf risers. Any cold water glue will suffice. Keep under clamps until the job is thoroughly dry. Before securing the clamps, check all parts for squareness of fit.

A resorcinal cement such as Caseophen makes an excellent bonding agent — waterproof, fungus proof, permanent.

This cement must be mixed — its resin with catalyst — as directed. It is no more difficult to mix than any of the cold-water glues. It is applied with brush, spatula, or roller, whichever is most convenient. There are other cements which are equally as strong — all of them stronger than most hot glues. Pliobond, Bakelite, Phenolic Cement, and

Twin-cabinet medicine chest




Twin-cabinet medicine chest detailed without doors shown in half tone

Rez-N-Glue are some on the market. The ¼-in. panel is glued into one frame; the other is not touched yet.

When the job is fully glued or cemented, the back panel is temporarily tacked into position. The butts are marked and fitted into place. The hardware is attached, then both the butts and hardware and back panel removed.

All parts — the open cabinets, the back panel, and the picture frame doors — are primed and painted. Give it several thin coats and rub it down after each one. The final coat should be of enamel. It might be well to paint the cabinet two-tone so that it matches with the color scheme of the bathroom or its tiled wainscot. In painting the parts separately, you avoid causing globs of paint to form in corners, and at the same time, it is easier to reach hidden recesses of the job.

Replace the hardware again and fasten it in place. In removing them during the painting process, the job was not only simplified, but the hardware was kept clean, as well. Insert the mirror into its frame, back it with the 1/16-in. plywood panel. Glazier's paints will fix this well enough, but a plastic cement like Rez-N-Glue or Pliobond applied along the contacted edges will hold it in place quite well.

A thin coat of floor wax thoroughly rubbed down will give the finished job a very lovely luster.

**BILL OF MATERIAL**

| *No. of pcs.* | *Name of part* | *Size* | |
|---|---|---|---|
| 2 | Sides | ⅞ x 6 | x 26 |
| 1 | Top | ⅞ x 6 | x 39 |
| 1 | Bottom | ⅞ x 6 | x 39 |
| 1 | Long partition | 1 x 5 11/16 | x 19¼ |
| 1 | Short partition | 1 x 5 11/16 | x 5¼ |
| 1 | Long shelf | ½ x 6 | x 39 |
| 1 | Shelf | ½ x 6 | x 19⅜ |
| 1 | Shelf | ½ x 6 | x 10½ |
| 1 | Shelf | ½ x 6 | x 8¾ |
| 2 | Shelf risers | ½ x 6 | x 5½ |
| 1 | Separating plate | ½ x 2 | x 26 |
| 1 | Back panel | ⅜ x 26 | x 40 |
| 2 | Picture frames for doors | 26 x 20 | |
| 1 | Plywood panel | 21 x 15 | x ¼ |
| 1 | Plywood panel | 21 x 15 | x 1/16 |
| 1 | Plate mirror | 21 x 15 | x 3/16 |
| 4 | Butt hinges | 3 in. | |
| 2 | Friction catches | | |
| 2 | Kitchen cabinet pull handles | | |

## SILK SCREEN PRINTING WITH TYPEWRITER STENCILS

**ALBERT KOSLOFF**
**Waller High School**
**Chicago, Ill.**

Silk screen printing is a phase of graphic arts which has really developed in the United States after World War I. Since then this process has grown into an industry which has developed its own techniques for printing on any surface or material. Basically, silk screen printing is a process in which a stencil bearing a design is attached to one side of a silk screen. When process paint or pigment is forced through the silk, only those parts of the design in the stencil which do not cover up the holes in the silk will allow this paint to deposit itself on the stock placed under the screen. Those parts of the design that do stop up the mesh in the silk will not allow the paint to be forced through or squeegeed upon the stock.

Today there are many types of stencils used in this country to print on almost any type of surface or material. Each stencil requires its own method of preparation and attachment to the silk screen. The stencils range from those which are used to reproduce minute detail and fine printing to stencils which print and coat large areas.

Printing with typewriter stencils by means of the silk screen process is similar to printing with other stencils. However, because of its simplicity and results obtained, it offers many advantages to the beginning and advanced silk screen operator. It is an ideal stencil to use as an introduction to the teaching of this process. It is flexible in its relation to its organization in a curriculum. It may be taught in high school, elementary school, and vocational school. It may be taught as part of printing, industrial arts, fine arts, sign painting, extracurricular activity, or as a course by itself.

Printing with typewriter stencils can be done on any type of paper, cardboard, wood, metal, plastics, fabrics, glass, etc. The inks or paints that are used are permanent and very durable and when the printing is dry it stands out in relief, giving the work an appearance comparable to embossing. Anyone without previous experience can do this printing successfully. Different colored inks may be used and the attractive feature of this printing lies in the fact that it is possible to print with typewriter stencils accurately and easily in more than one color. It is a cheap method, since little equipment is required. The process offers an excellent method to the school or individual in need of reproducing varied printed matter. One, two, three, or even four stencils can be printed at one time, thus saving work and time.

### Required Materials and Equipment

To do silk screen printing with typewriter stencils, the printer will need the following materials and equipment: (1) a *silk screen frame* to which the stencil is attached; (2) a *squeegee* for forcing the ink or paint through the silk screen upon the stock placed under the screen; (3) a good grade *typewriter stencil;* (4) *process paint* or *ink;* (5) *stock* upon which the printing is to be done; (6) a *stylus* or two or three styli for making illustrations and lines on the stencil; (7) *masking tape* for attaching stencil to screen; (8) *kerosene* for cleaning the screen after printing; and (9) lintless *rags.*

The materials may be obtained from silk screen establishments, sign painting establishments, stationery stores, or art supply stores.

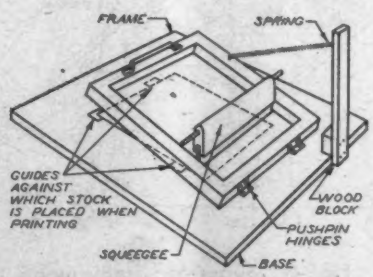



Fig. 1. A silk screen printing outfit

### The Silk Screen Frame

The silk screen frame is one of the most important parts of the processor's equipment. Screens may be bought or made. Figure 1 shows an outfit that may be made easily by the beginner. In making the sides of the frame,

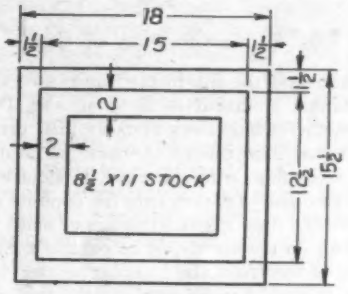



Fig. 2. Dimensions of frame for printing one stencil

use a soft, kiln-dried, knot-free wood, such as white pine or basswood. Make the sides of lumber that is about 1½ in. square. Figures 2 and 3 show dimensions of screens for printing one or two stencils at one time. As the processor progresses he may make frames that will print three or four stencils at one time. Although many constructions may be used, it is suggested that the joints shown in Figure 4 be used for the construction of the frame. These may be glued and screwed or glued and nailed. Sandpaper the wood well, rounding the corners and edges in the process of sandpapering. This is necessary to prevent the corners from scratching or cutting the silk when it is attached to the sides of the frame. After sandpapering, if boiled linseed oil is available, rub it into the wood and then allow the frame to dry before tacking on the silk.

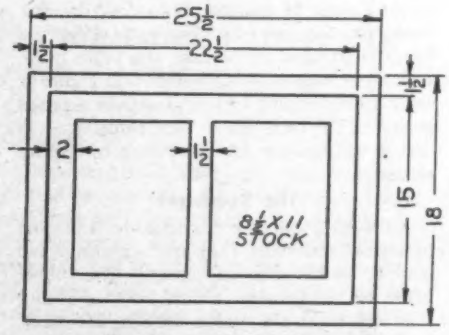



Fig. 3. Dimensions of frame for printing two stencils at one time

Silk which is used for this type of printing is numbered, the numbers depending upon the openings or mesh between the threads. Numbers 12, 13, or 14; numbers 12X, 13X, or 14X; or numbers 12XX, 13XX, or 14XX weave of silk may be used. The X or XX after a number indicates a stronger weave of silk. Besides silk, strong bolting cloth, organdy, silk-organdy, or taffeta silk may be used. The different fabrics come in varied widths and prices.

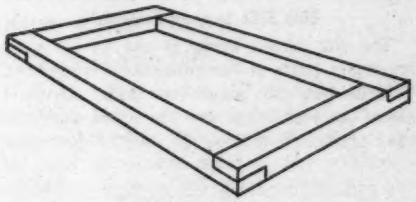


Fig. 4. Construction of frame

In tacking the silk to the frame, use carpet tacks that are about ⅜ to ½ in. long. Drive down the outside rows of tacks first, driving them just hard enough to make the heads of the tacks flush with the wood. First tack the silk onto one side, then onto the opposite side, tightening the silk at the same time. The threads on the silk should be parallel with the sides of the frame. In a similar manner, hammer down the tacks on the other two sides, making sure that the silk is stretched tight. The inside rows of tacks are staggered as shown in Figure 5. The tacks should be kept about ¾ in. apart. After the silk is tacked on, wash the silk carefully with cool water to remove sizing. This washing will also aid in tightening the silk. Silk that is well attached and taken care of will last for a long time.

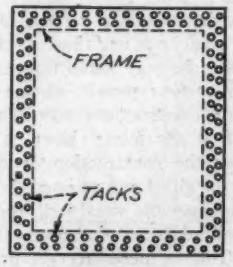



Fig. 5. Tacking silk to frame

Use a piece of smooth plywood or drawing board for the base. See Figure 1. After the frame is attached to the base or a table, make a spring arrangement as illustrated in Figure 1, using a door spring, to keep frame in a raised position. This will leave both hands free so that it will be easy for one person to operate screen.

### The Squeegee

Although a squeegee can be made, it is more practical to buy one. They are inexpensive and may be obtained in any length. The rubber blade on the squeegee should be of a quality that will resist the actions of oils, kerosenes, lacquers, commercial cleaners, etc. It is advisable to insert a dowel rod at each end of the wooden handle as shown in Figure 1, to prevent squeegee from falling into paint in the screen when printing. If the edges on the blade become rounded or dull, the blade may be sharpened by holding it in an upright position and rubbing it back and forth over emery cloth or garnet paper.

### Silk Screen Paints or Inks

Most silk screen inks are really oil paints. Although, the silk screen operator may mix his own paints or inks, it is suggested that the beginner buy his paints ready mixed. Silk screen paints, generally, are thick and come prepared for use and for ordinary purposes it is not necessary to add anything to them. However, for printing with typewriter stencils the paint should be mixed thinner than for ordinary silk screen work. Many different inks may be employed, but the best inks to use at first with typewriter stencils are silk screen enamels which dry hard and flexible with great brilliancy in about 2 to 12 hours. Use a reducer or a good quality spar varnish for thinning the enamel.

The prices of silk screen inks are about the same as those of ordinary good grade paint. A good grade silk screen paint is one that will not clog up the screen, that will not dry while the work is still in progress, that will be very durable, and will have a certain beauty that is peculiar only to silk screen paint.

In using any silk screen ink, the directions of the manufacturer must be followed accurately. To clean off most silk screen paints, use kerosene, gasoline, a mixture of kerosene and gasoline, or commercial cleaners. Different inks require different cleaners. For cleaning typewriter stencil jobs, kerosene is ideal because it cleans well and also strengthens the stencils.

### Preparing the Stencil

Any good grade typewriter stencil may be used in this printing. To avoid possible errors first make a "dummy," that is, make the drawings and type the matter in the same position on a paper as it is to appear on the stencil. This dummy may be saved and used to make another stencil, if necessary. When typing on a stencil, type slowly and uniformly, striking the typewriter keys with a little greater force than in ordinary typing. In drawing, writing, or ruling lines on a stencil, use a correct stylus with a writing plate under the stencil and make sure that the lines are clean. For ease in drawing on stencils, use the portable illuminated drawing arrangement illustrated in Figure 6. These illuminated drawing outfits may also be bought.

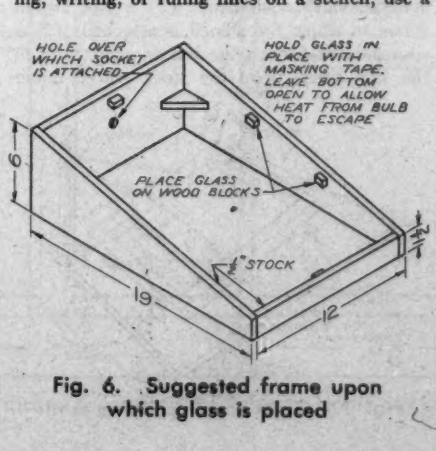

HOLE OVER WHICH SOCKET IS ATTACHED
HOLD GLASS IN PLACE WITH MASKING TAPE. LEAVE BOTTOM OPEN TO ALLOW HEAT FROM BULB TO ESCAPE
PLACE GLASS ON WOOD BLOCKS
6
STOCK
19
12

Fig. 6. Suggested frame upon which glass is placed

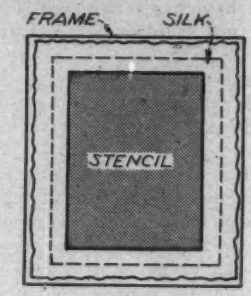



Fig. 7. Centering stencil on underside of screen

Generally, follow manufacturer's directions carefully and very little difficulty will be encountered. As one works with these stencils, a technique is developed which makes the printing comparable to other methods of printing.

### Attaching Stencil to the Screen

After the stencil is prepared, it is removed from the backing sheet to which it is attached. Then the silk screen frame is removed from the base by pulling out the pins in the hinges. Turn frame so that silk side is up and center the stencil on the silk, with the typed or positive side of the stencil down and in contact with the silk. Attach the stencil on one side to the silk or frame with masking tape, making sure that the tape overlaps the stencil about ½ in. This overlapping of tape is necessary to prevent any of the paint being squeegeed through at the edges during the printing operation. The stencil is then attached on the opposite side, pulling lightly on stencil to prevent formation of wrinkles. In a similar fashion, finish attaching the other two sides of the stencil. Cover all the open spots outside the stencil area with masking tape as shown in Figure 8, to prevent paint from seeping through during printing. The tape should be pressed down carefully on silk and stencil to make sure that tape sticks well to all parts. The sticky quality of the paint will make the rest of the

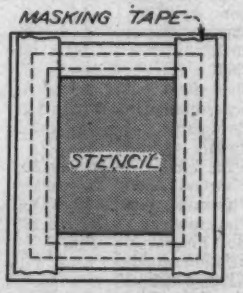



Fig. 8. Attaching to screen with masking tape

stencil adhere to the silk when the paint is being pressed through with the squeegee.

### Printing

After the frame is hinged onto the base, attach a sheet of paper or thin cardboard to the base with masking tape exactly under the screen. The cardboard should be about ¼ in. smaller in size than the inside dimensions of the screen. Now place guides on paper or cardboard. The stock on which the printing is done is placed against these guides to insure that the printing impression is made exactly in the same location on all copies. One or two layers of small pieces of masking tape or thin cardboard may serve as guides. See Figure 1. Pour enough silk screen paint on inside of frame but not so much that the paint will run over the sides of the frame when the screen is continually lifted during printing process. Place the stock against the guides, lower the frame, and force paint through with the squeegee. Hold squeegee at about a 60-degree angle to the silk and use enough pressure to obtain a neat and even impression with one stroke of the squeegee. It may take a few impressions for the paint to work through before clean impressions are obtained. Once the printing is started, all that is necessary is to place the stock, make impressions, and pick up or peel the printed paper from the stencil, should it stick to the stencil. A stencil of this type should last for about 1000 to 5000 impressions, depending upon the quality of the stencil.

Since most enamels take 2 to 12 hours to dry, it is advisable that the printed sheets are not piled one on top of the other. To test for thorough drying the printing may be scratched with one's fingernail. If the printing is not soft or if the ink sticks to the stock, the sheets may be stacked in piles. Figure 9 shows a simple drying rack that is easy to make.

Printed matter may also be dried by being placed or hung on strings or wires which have been stretched across a room.

### Cleaning the Screen and the Stencil

After the printing is completed, use a cardboard to remove the ink from the screen and pour the ink from the cardboard into the original container. Then place a few sheets of newspaper between the screen and the base, hold the screen down and pour in enough kerosene to just cover the silk and dissolve the ink that is hugging the silk or frame. Keep the screen down and work the kerosene back and forth with the squeegee until all the paint is dissolved. Take a soft cloth and carefully wipe away the kerosene and the dissolved paint. Squeeze out the cloth and wipe off the rest of the liquid left on the silk and frame. Kerosene can be washed off easily and will not hurt the hands. If the screen is still not completely washed, then put in another few sheets of clean newspaper between frame and base and use a rag that has been soaked in kerosene to clean the silk and frame thoroughly. During this whole

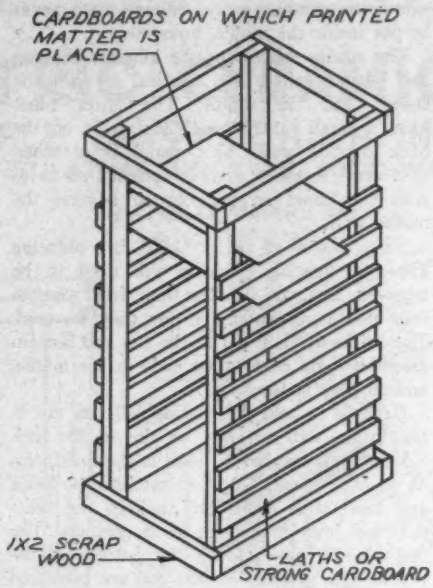



**Fig. 9. A homemade drying rack. The size of rack is varied to suit individual needs**

cleaning operation the screen should be kept in a lowered position.

At the same time that the screen is being cleaned the stencil is also being washed, although, it is actually not being rubbed with the cloth. After the silk is cleaned, raise the screen and very carefully rub a soaked kerosene cloth over the stencil until you are positive that the paint has been cleaned out of the stencil. When the stencil is clean, gently peel off all masking tape and place stencil between two sheets of newspaper. Blot the stencil with newspaper and allow it to dry naturally. When stencil is dry it may be filed away to be used again. When the silk has dried, the frame is ready for the next printing job.

**Sample of silk-screen printing**

Although the cleaning operation is simple, it must be thorough, for if the paint is not cleaned off well from the silk and stencil, the paint will dry and will be almost impossible to remove.

The squeegee is also cleaned in a similar fashion so that it may be ready for the next job.

For those who do much silk screen printing, it is suggested that they make a pan in which kerosene may be kept. Then all that will be necessary to do to clean the frame is to dip the frame with the stencil on it in the kerosene.

### Printing in More Than One Color

Printing with two or more colors is similar to printing a one-color job. There are two methods of accomplishing this. One method is to make as many stencils as there are colors to print. For instance, if drawings are to be printed in one color and the typed matter in another color, then a separate stencil is made for the drawings and another stencil is made for the typed matter.

Another method that may be used for multicolor printing is to stop up with masking tape or Scotch tape all those parts of the stencil that are not to print. The tape should be adhered to the stencil so that it is between the silk and the stencil and not on the outside of the stencil. If the tape is on the outside of the stencil, it will come in contact with the stock and may sometimes blur printed copies.

### Printing More Than One Stencil at One Time

Two, three, or more stencils are easy to print at one time. The silk screen frame, of course, will have to be larger if more than one stencil is to be printed at one time. The preparation of the stencils and the adhering to the silk is the same as for printing one stencil. The only difference is in planning the cutting of the stock and in the placing of the stock against the guides; for example, in printing three stencils at one time, it is best to print the three stencils on one sheet of paper and then cut the paper into the three required sheets. This method is better than to place three single sheets against guides on the base for every impression made.

## A HOMEMADE POTTERY KILN

**ELMER A. MORROW**
Chicago Teachers College
Chicago, Ill.

Because it is difficult and often impossible to find anyone who will fire pottery made in the home or in the school, it is advantageous for the potter to have an inexpensive, easily operated kiln in which to test and complete his work. Most commercial potters do not care to take orders for firing. Furthermore, should a kiln be found available off the premises, it is costly and difficult to transport

green or unfired pieces any distance without damage.

The advantages in doing one's own firing are apparent to the teacher. The kiln is a necessity since the knowledge of the importance of the kiln grows with its use. Only those successful pieces which come out of the kiln having a practical use and artistic quality are worthy of the cost and effort employed to produce them.

The following described kiln can be made and used by the home studio potter or anyone who has the ordinary skill required of the beginner in pottery making and modeling. Home mechanics teachers and advanced pottery students will find it invaluable. The shop teacher, directing the efforts of his pupils in the assembly and operation of the kiln, will appreciate the fact that its maintenance is no great chore.

Using the following general plan, various sizes can be provided for tests, for small and medium size pieces, for Parian and other ornament, and for lamp bases, flower containers, tiles, and other articles of similar size. This kiln has the minimum of structural detail, is reasonably easy to maintain, and can be made at low cost. It will biscuit fire and glaze fire student and professional work with equal ease at cone 04. It operates on the 110-volt or 120-volt circuit only. What it may lack in capacity may be made up by building the number needed to handle the volume of work produced. It requires little attention and will not burn out because of power overload. The operation of more than one kiln at a time will allow biscuit firing and glaze firing to proceed without waiting. The two firings should not be carried on in any kiln at the same time. Biscuit-fired work should not long remain unglazed since handling and accumulated dust will cause the glaze to crawl.

The materials required are Armstrong insulating bricks, a few homemade clamps of the bolt and screw variety, nichrome wire, brass screw connections, appliance cord, and pull plugs. The bricks can be puchased from the Risher Fire Brick Company, 2445 South Ashland Avenue, Chicago, Ill., or from your own material dealer. Few tools are needed. The bricks come packed in cartons of 25, cost about 16 cents a brick, and are made in three grades: number 20, which will stand a temperature of 2000 deg. F.; number 23, which will stand 2300 deg. F.; and number 25, which will stand 2500 deg. F. The softer the brick, the higher the temperature it can stand. Although these are not structural bricks, they require no reinforcement to stand ordinary stress, when clamped into small units or subassemblies. This is true of all kiln sizes up to and including 8½ by 9 by 9 in. In the following described kiln, number 23 bricks are used. They are put together in suitable stock sizes, with little or no cutting. However, they are easily cut, sawed, drilled, or ground to any desired pattern.

Thin mixtures of fire clay will seal the joints, and painting the outside surfaces with thinned sodium silicate will prevent the outside from grinding away. Silicate must never be put inside the muffle, however.

The subassemblies for the kiln are the top and bottom, which are identical in size; the stand; and the muffle. The latter must have a small safety panel of transit on the back outside wall. This panel is attached to a cross member or two, fastened so as to hold the panel an inch or so beyond the muffle wall.

Since this, as all pottery kilns, is a reducing kiln, the heating elements will need to be renewed, but not oftener than from one to four months, depending on how they are used. The bricks are laid flat in the top and bottom assemblies, on edge or on ends in the muffle, and on edge in the stand.

Grooves to hold the heating coils are cut in the inside wall surfaces of the muffle with a homemade rougher bit used in the drill press at medium speed. They are cut into the brick and must slant downward to keep the heat-unit coil from falling out of the grooves. The coils should never touch the pottery in the muffle. The grooves for the coil are even and parallel on each inside wall of the muffle except on the back, or panel side. Here they slant downward from the first position to the one just below. This makes it possible to run each of the heat coils more than once around the muffle. The grooves are spaced farther apart between the units to allow for a half-inch peephole on the outside of the front wall and a wide-angle slot on the inside of the front wall. This peephole in the front of the kiln is covered with a small sheet-iron plate swinging on a hooked iron pin. The brick is soft enough to permit the scratching of the grooves with a screw-driver point and straight-edge. The back wall of the muffle carries the lead-in wires to the safety panel through small holes drilled in the brick. Supply wires are attached to brass machine screws which are put through the transit panel so they may be attached from the outside and the lead-in wires attached from the inside next to the muffle wall. Copper washers should be used on the screws and connections, and appliance cord for the supply wire, with good strong pull plugs into the electrical outlet. Two separate coils of resistance wire are laid into the grooves, giving the total wattage required for the kiln.

The lead-ins are additional lengths of resistance wire beyond that needed to give the resistance required at the ends of the coils. To each of these is added a folded, not kinked, piece twice the length of each lead-in. These three wires, all the same length, are twisted into a stiff strand. This strand will not heat up since it has less resistance than the coil. There are no joints between the lead-ins and the coils and one continuous wire runs through both of them at the ends of each coil.

The heat coils, but not the twisted lead-ins, are made on a spring mandrel of about one half inch, or of such size as will fit the grooves in the muffle without forcing. A string is then laid into the grooves in the assembled muffle beginning with the first lead-in hole, then around the muffle to the next lead-in hole. The coil is then stretched out evenly, on a table top or on the floor, to match this string pattern. Avoid kinking the wires and avoid burring them with the pliers or in the jaws of the vice because at these points the current will arc and burn the wire in two.

In all kiln sizes use high temperature nichrome wire of chromel-V grade or better. For the resistance in small kilns, i.e., 7 by 7 by 5 in., use two nichrome wires each 23 feet long of 22 gauge. Add to these the lengths for lead-ins on both ends of both wires. Each of these will draw 500 watts. For the larger kiln, i.e., 8½ by 9 by 9 in., use two wires each 29 ft. 3 in. long, of 18 gauge and add the lead-ins to each of the four ends. Each of these coils will draw 1000 watts.

Connect each of the coils to the same double outlet, 110-120 volt circuit. Protect the circuit with 20 ampere fuses. No rheostats or switches are required. Do not use any of the other outlets on the kiln circuit during the firing period.

To start the kiln, simply plug the coils in. After the atmospheric moisture is dried out of the work, put the top on the kiln and run from six to eight hours, depending on the load in the kiln. A longer time will do no injury since the units will not overheat.

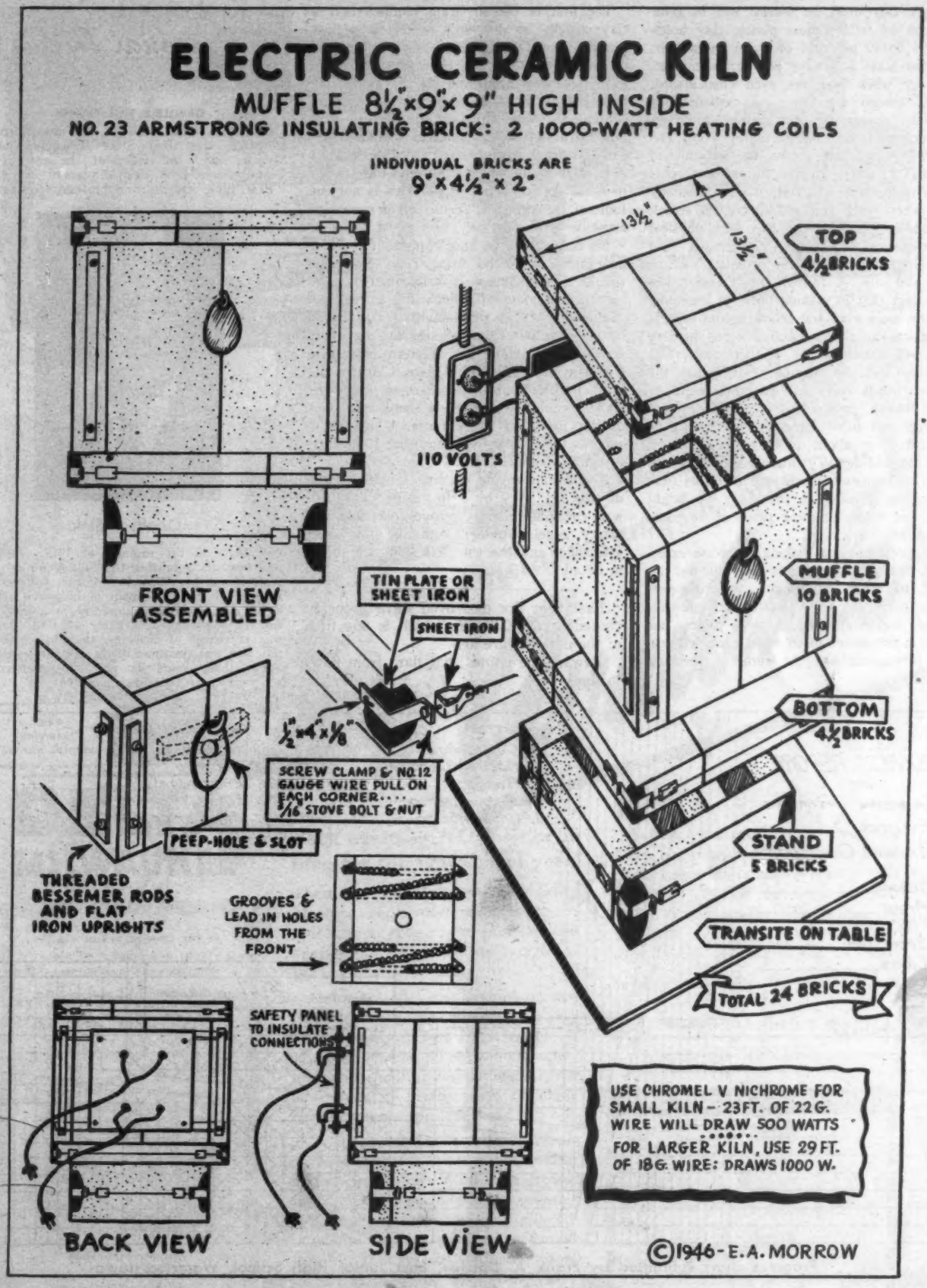
Do not use any of these kilns on any 220-volt circuit. Do not load the kiln circuit beyond 2000 watts.

For unloading and loading the kiln, lift off the top, but keep the kiln covered at all other times to protect the coils. Bend the wire coils carefully at the corners of the muffle so that there is no spring in them. Cover the bottom of the kiln with a quarter inch of fine grog.

The muffle must always be tight fitting in all its parts to prevent air from entering. The top and bottom assemblies must fit, and the screw clamps should be tight enough to hold the assemblies securely at all times, thus preventing drafts of air and loss of heat.

Since heat energy pushes upward, an extra layer of brick or of unfired pottery on the top will conserve this energy. The joints can be sealed with fire clay, which should be dried before firing. Biscuit fire for the same time and to full temperature as for glaze firing. In each case hold the high temperature for at least two hours to mature the glaze, otherwise it will craze. Glaze materials must not only melt and fuse but must also be held at the fuse point until the oxygen, water of crystallization, and other things which harm the glaze are driven off by the heat. Allow the kiln to cool as slowly as possible after the firing period is finished. If the firing is done uninterruptedly from 9 a.m. to 5 p.m., the supply wires should be disconnected by pulling the plugs from the outlet. The kiln can then safely be opened the following morning. This means that one firing a day is all that can be expected. This is true of all small kilns; large kilns have even less flexibility.

The utility and attractiveness of fired clay products lie in the nature of clay materials.


ELECTRIC CERAMIC KILN
MUFFLE 8½"×9"×9" HIGH INSIDE
NO. 23 ARMSTRONG INSULATING BRICK: 2 1000-WATT HEATING COILS
INDIVIDUAL BRICKS ARE 9"×4½"×2"
13½"
13½"
TOP 4½ BRICKS
110 VOLTS
FRONT VIEW ASSEMBLED
TIN PLATE OR SHEET IRON
SHEET IRON
MUFFLE 10 BRICKS
BOTTOM 4½ BRICKS
½"×4"×⅛"
SCREW CLAMP & NO. 12 GAUGE WIRE PULL ON EACH CORNER.... 5/16 STOVE BOLT & NUT
PEEP-HOLE & SLOT
THREADED BESSEMER RODS AND FLAT IRON UPRIGHTS
GROOVES & LEAD IN HOLES FROM THE FRONT
STAND 5 BRICKS
TRANSITE ON TABLE
TOTAL 24 BRICKS
SAFETY PANEL TO INSULATE CONNECTIONS
USE CHROMEL V NICHROME FOR SMALL KILN - 23 FT. OF 22 G. WIRE WILL DRAW 500 WATTS
FOR LARGER KILN, USE 29 FT. OF 18 G. WIRE: DRAWS 1000 W.
BACK VIEW
SIDE VIEW
©1946 - E.A. MORROW

Details of electric ceramic kiln

The wet clay must be *plastic* and in good condition or fettle; most plastic clay holds from 25 to 40 per cent of water by weight. The clay mass is always *porous;* when wet, when dry, when fired, yes, even when glazed. It will absorb moisture and carbonaceous materials, as can be proved by placing an old much-used dinner plate in the oven. The heat will cause the grease to boil out to the surface, and it can be burned out completely in the kiln. The clay mass is relatively *dense* when fired, and will ring when struck a light blow. These are the three basic physical characteristics of pottery, stoneware, and porcelain and of other clay products such as brick and tile. A fourth characteristic lies in the fact that in making pottery, beginning with the moist clay and following the process through to the glazed, finished ware, the clay mass will shrink about 10 per cent. This shrinkage and the control of it causes the beginner much worry and disappointment.

The lowest temperature at which clay can be fired and have sufficient density to be practical is at about 1000 deg. C. This is equal to 1832 deg. F. which is approximately the firing temperature at cone 04. This temperature is indicated in the kiln by a bright cherry-red color. In using this kiln no cones are needed.

The potter avoids making his ware excessively heavy. Nevertheless he will not attempt to make lightweight, thin dishware in his pottery kiln. A substantial earthlike weight, together with textures, colors, and forms in proportion in an equal mass or thickness throughout are the aims of the best potters.

The first or biscuit firing requires that a clay article be dry and protected against cracking and warping in the kiln. All modeled pieces must be cut out from the bottom to even thickness throughout. If the moist clay mass is built up of pieces of varying moisture content, the work will warp and crack in drying and firing. Wet clay pieces should, therefore, be dried slowly.

If glaze is put on unevenly and too heavily in spots the work will crack. This is not the fault of the kiln. The coefficient of expansion must be kept constant.

No clay should be bought unless the dealer guarantees it to be firing clay. No glaze should be used unless it is formulated to go on the clay body with which it is to be used. Monmouth clay is the standard clay found in the northern midwest region, and may be purchased from the Western Stoneware Company, 124 West 46th Place, Chicago, Ill., or their distributors. Before using, clays and glazes should be tested on small test slabs of clay made for this purpose. A small kiln, such as the 7 by 7 by 5 in., using 1000 watts is here recommended.

The accompanying drawing shows the kiln in size 8½ by 9 by 9 in., using two 1000-watt coils. The clamps, grooves, peephole, and safety panel, together with the four subassemblies and the complete kiln, are shown in detail.

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Last year fire destroyed farm property valued at $90,000,000, which is one fifth of the national fire loss.

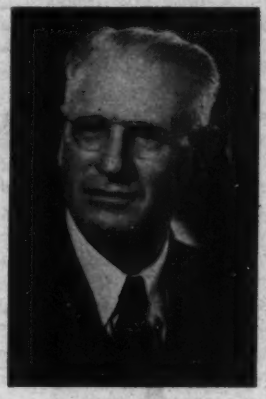
**Beware the flames that flare from flaws in flues!**

## Personal News

### ORVILLE E. SINK RETIRES

Orville E. Sink, head of the department of industrial arts, Ball State Teachers College, Muncie, Ind., will retire at the end of the second summer term, after 37 years of service.

Prof. Sink was the first professor to come to

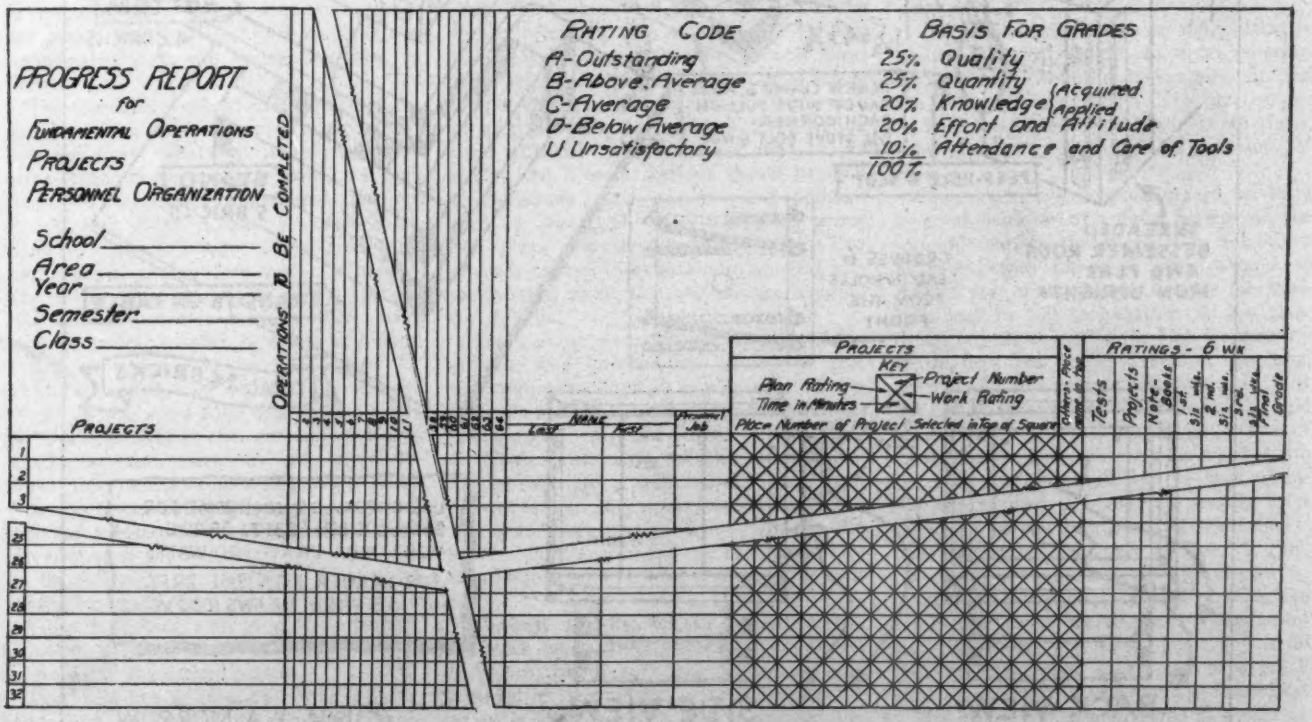


Orville E. Sink

Ball State in the summer of 1918, when the Ball brothers purchased the college property and gave it to the state. In addition to his work as head of the department of industrial arts, he has had various duties since the founding of the college. When he first came to Ball State he was in charge of coaching and physical education and was chairman of the athletic committee.

For three years he was superintendent of

(Continued on page 12A)




Progress chart submitted by Frank A. Dutcher, East Junior High School, Waterloo, Iowa

Delta 17" Drill Press (for metal, wood, or plastics)
Delta Abrasive Disk Finishing Machine
Delta Super-Hi*-Speed Drill Press
Delta 14" Metal-Cutting Band Saw (wood-cutting or metal-cutting)
Delta Abrasive Belt Finishing Machine
Delta Cut-off Machine
Delta Toolmaker* Surface Grinder
Delta* metalworking Machine Tools
Available

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**These bulletins may prove useful in helping you specify Delta metalworking machines:**

**Bulletin A-14-3** pictures and describes Delta Super-Hi*-Speed Drill Presses, for small-hole work from .025" dia. to ¼".

**Bulletin A-17** pictures and describes Delta 17-inch Drill Presses.

**Bulletin A-20** pictures and describes Delta Cut-Off Machines.

**Bulletin A-23** pictures and describes Delta Toolmaker* Surface Grinder, Chip-Breaker Grinder, Tool and Cutter Grinder.

**Bulletin A-28** pictures and describes Delta Metal-Cutting Band Saw.

**Bulletin A-31** pictures and describes Delta Abrasive Finishing Machines (belt and disk types).

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*Trade Mark Reg. U.S. Pat Off.

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S-36

(Continued from page 266)

buildings and grounds. In connection with his work as superintendent, he had charge of the Normal City Waterworks. During World War I, he drilled the S.A.T.C. at the college and taught military law.

Prof. Sink and Dr. William E. Warner of Ohio State University were cofounders in 1929 of the Epsilon Pi Tau national honorary fraternity in industrial arts education, and Mr. Sink has been president of the national board of that fraternity since the founding. At present there are 22 chapters in all parts of the United States, and six more chapters will be established this summer.

Mr. Sink is a member of the National Education Association, National Vocational Education Association, and Indiana Vocational Education Association.

He was born on a farm in Owen County and was graduated from Gosport High School in 1906. Receiving his B.S. degree from the Indiana State Normal School, he later received the A.M. degree from Ohio State University. In 1910 Mr. Sink worked at the University of Illinois.

He has taught in the Owen County schools and in Anderson High School, where he was coach from 1910 to 1913. From 1913 to 1918, he taught industrial arts and later was head of the department of physical education and coach at Indiana State Normal School at Terre Haute. He taught two summer terms at Ohio State University.

### PROFESSOR SIEPERT DIES

Albert F. Siepert, vice-president of Bradley University, Peoria, Ill., died Wednesday, April 30, at his home in Peoria.

He was born at Chippewa Falls, Wis., on September 12, 1883. He was graduated from the Manual Arts Teachers Course at Bradley Polytech, in 1908, and from The Stout Institute, Menomonie, Wis., in 1910. He received his B.S. degree from Teachers College, Columbia University in 1913, and has done graduate work at Teachers College, Columbia University, and at the University of Chicago during the summer sessions in 1926 and 1927. He received his master's degree from this latter University.

Mr. Siepert taught in the public schools of Iowa City, Iowa, from 1904 to 1907; at Northwest Missouri State Normal School, 1908–9; in the public schools, Montclair, N. J., 1909–13; was professor of education, dean of the industrial education division, and director of the summer session at Bradley University from 1913 to the present time. He was made vice-president of Bradley University quite recently.

He was a member of the American Vocational Association, the National Educational Association, the Western Arts Association, Illinois Industrial Education Association, The Manual Arts Conference, Phi Delta Kappa, and Pi Gamma Mu.

He was always active in things pertaining to industrial arts and vocational education, was the author of several books in this field, and contributed numerous articles to the professional magazines of this particular type of education.

Mr. Siepert is survived by his widow, his father, one son, and two daughters.

### DR. SCHMIDT SUCCEEDS PROFESSOR SINK

Fred J. Schmidt, Jr., has been appointed professor and head of the industrial-arts department at Ball State Teachers College, Muncie, Ind., to succeed Professor Orville E. Sink, whose resignation was accepted recently.

Dr. Schmidt, who will assume the duties of Professor Sink, came to Ball State Teachers College in 1935 and received his doctor's degree in education from Indiana University in 1941. He received his A.B. degree at Iowa State Teachers College in 1923 and his A.M. degree from the University of Wisconsin in 1928. He has taught in rural schools, has been superintendent of a consolidated school in Iowa, has taught at Iowa State Teachers College and at Iowa State College. Dr. Schmidt is a veteran of World War I.

He is a member of a large number of state and national organizations and has been very active in the National Planning Committee on Industrial Arts and of the American Vocational Association. He is a member of the Mississippi Valley Conference of Teacher Trainers, and is on the executive committee of the Indiana Industrial Education Association.

He served as supervisor of industrial arts in Indiana for two years and also served as president of both the Iowa and Indiana Industrial Education Associations. He has been author and coauthor of a number of works in industrial arts.

### VETERAN RETIRES

L. F. Knowles, veteran print shop teacher at the John A. Johnson High School, St. Paul, Minn., retired at the close of the school year 1945–46. He is one of the first, if not the very first teacher of printing in Minnesota. He organized his first class in this subject at Mantorville in 1913.

Mr. Knowles was educated in the public schools of Buffalo County, Wis.; is a graduate of The Stout Institute, and has done advanced work at Bradley Polytechnic School, the University of Minnesota, and Macalester College. He is a charter member of the St. Paul Club of Printing House Craftsmen, and a member of the National Graphic Arts Education Association, National Association for Printing Education, and The Stout Institute Printing Teachers Association.

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♦ Aurilien J. Belanger has been associate professor of industrial arts in charge of industrial arts and engineering drawing at Kent State University, Kent, Ohio, during the past year. He received his B.Sc. degree in education from The Stout Institute and his M.A. degree from the University of Minnesota. He has had extensive experience in secondary schools in industrial arts and guidance work, and eight years' experience in engineering with the Pioneer Engineering Co., Minneapolis, Minn.

♦ Delmar W. Olson, associate professor of industrial arts at Kent State University, Kent, Ohio, has been giving the major portion of his time during the past year to ceramics, industrial arts design, crafts, and graduate work.

Mr. Olson received his B.S. degree from Iowa State College and his M.A. degree from Ohio State University. He also has to his credit considerable work beyond his M.A. degree toward his doctorate. He has had extensive experience as an industrial-arts teacher, county supervisor, and most recently teacher trainer at Southern Illinois Teachers College, Carbondale, Ill.

♦ Joseph F. Morbito, associate professor of industrial arts at Kent State University, Kent, Ohio, is in charge of architectural drawing and design. He has a degree in architecture from Carnegie Tech., and his M.A., from the University of Pittsburg. Mr. Morbito also has had extensive experience as a teacher of industrial arts in public schools at East Liverpool and Youngstown, Ohio, in addition to several years of successful experience as an architect.

♦ C. P. Scott, vocational education teacher from the University of Pittsburgh, Pittsburgh, Pa., will be a member of the department of industrial education of Northwestern State College, Natchitoches, La., for the summer term, 1947.

♦ Walter J. Robinson, head of the department of industrial education, Northwestern State College, Natchitoches, La., will be in attendance at the University of Missouri, working on his doctorate.

♦ Verne L. Pickens, director of practical arts in Kansas City, Mo., will be guest professor at the University of Minnesota, Minneapolis, Minn., during the summer of 1947.

♦ Andrew W. Paton, assistant professor of industrial arts at Kent State University, Kent, Ohio, is in charge of aeronautics. He received a B.S. degree from Wooster College, and his M.A. degree from Kent State University.

Mr. Paton has been a school administrator and a teacher of industrial arts. He began his work in aviation early in the civilian pilot training program. He also has had three years of experience with Goodyear Aircraft.

♦ Frank A. Marschik is an assistant professor of industrial arts at Kent State University, Kent, Ohio. He has his B.S. degree in education from Illinois State Normal University and his M.S. degree in education from the University of Illinois, Urbana, Ill. He has served an apprenticeship of 4000 hours plus four years of journeyman experience as a machinist in experimental tool engineering with Westinghouse.

♦ Charles J. Kessler, Jr., has been teaching industrial arts at Kent State University, Kent, Ohio, during the past year. He has his B.S. degree in mechanical engineering from the University of Michigan. He has had extensive experience in production engineering and design, and came to Kent State University from the Case School of Applied Sciences, Cleveland, Ohio.

♦ Stanley J. Pawelek, supervisor of industrial education, Baltimore, Md., addressed the West Virginia Vocational Association on the subject of "Shall We Remodel Vocational Education" at their meeting on March 29. He also delivered an address on "Taking Inventory of Our Stock," at the Oswego Spring Industrial Arts Conference on May 1.

He will teach at Penn State College during the summer session. His work will be in the field of industrial-arts supervision.

♦ Carlyle H. Smith has been appointed to the faculty of the University of Kansas to take up his duties there in September. His work assignment is to lay out a shop, besides teaching art metal and jewelry in the department of design.

## Association News

### AMERICAN INDUSTRIAL ARTS ASSOCIATION CONVENTION

The convention of the American Industrial Arts Association was held at Columbus, Ohio, April 24 to 26, 1947. The task which the association set for itself was to discuss the general topic of what necessary steps are to be taken to reconstruct industrial arts in America.

The first session was a luncheon meeting at the Dorst Hall in the Columbus Y.M.C.A. building. The general subject for this session was "Trends at Baccalaureate and Master's Levels."

Otto A. Hankammer, chairman, department of industrial arts and vocational education, Pittsburg, Kans., pictured the broader education which the industrial-arts teacher must acquire to prepare for the task of being a master teacher. He emphasized that better selection of students aiming to be industrial-arts teachers must be made.

DeWitt Hunt, chairman, department of industrial arts and engineering shopwork, A. and M. College, Stillwater, Okla., called attention to the fact that many industrial-arts teachers now hold high administrative educational positions. He also insisted that students aspiring to take up graduate work should be expected to maintain good scholastic standings, and that they should have access to shops and laboratories which would help them to advance work of a practical nature. Also that strong history courses on industrial education be part of these advanced courses.

John A. Whitesel, Miami University, Oxford, Ohio, discussed "Accomplishments in Research and the Doctorate — An Epsilon Pi Tau Brochure for the Period 1941–1947."

Robert E. Smith, Ohio State University, Columbus, Ohio, summarized this session. It was his contention that a teacher, after acquiring a bachelor's degree, should get practical teaching experience before acquiring a higher degree. He felt that industrial arts must emphasize avocational

(Continued on page 14A)

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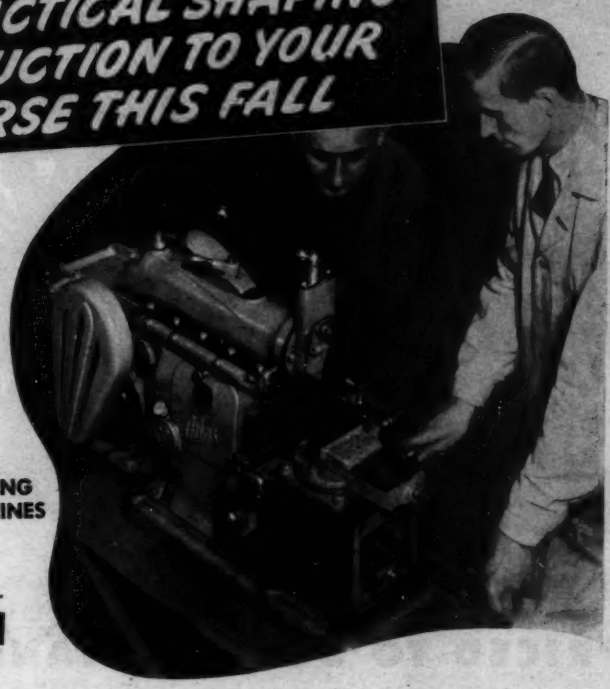

Photo of Atlas Shaper courtesy Springfield (Mass.) Public Trade School

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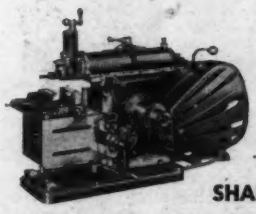

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(Continued from page 12A)

work, consumer values, vocational guidance, and safety.

Clifford K. Lush, Board of Education, Minneapolis, Minn., was the chairman of the second session at which "State Supervision, Its Nature and Functions" was discussed. Lawrence C. Secrest, State Teachers College, DeKalb, Ill.; William D. Stoner, Miami University, Oxford, Ohio; H. O. Thomas, State Department of Education, Baton Rouge, La.; and Philip S. Waldeck, State Department of Education, Columbus, Ohio, discussed this important subject, and G. R. Sutherland, Department of education, Halifax, Nova Scotia, summarized the deliberations.

The third session was a "Planning Conference of Association Leaders," at which policies, plans, programs, and publications of the American Industrial Arts Association were discussed.

The fourth session on Friday morning was devoted to "The New Industrial-Arts Curriculum." Dwight K. Curtis, State Teachers College, Cedar Falls, Iowa, was chairman. After a preliminary statement by William E. Warner, Columbus, Ohio, on "A Curriculum That Will Reflect Technology," the subjects of the possibilities of the divisions on power, transportation, communication, construction, and manufacturing, as well as on personnel organization, were presented by Major John P. Lisack, A.C., Air University, Maxwell Field, Ala.; Paul L. Kleintjes, Oswego, N. Y.; Carlton J. Gerbracht, South Hampton, L. I., N. Y.; Harold G. Gilbert, Springville, N. Y.; Kenneth Phillips, Columbus, Ohio; and Joseph E. Gary, Youngstown, Ohio.

At the fifth session, which was a round-table discussion presided over by Walter R. Williams, Jr., professor of education, University of Florida, Gainesville, Fla., Leroy A. Blaser, board of education, Ogden, Utah; D. Arthur Bricker, board of education, Cincinnati, Ohio; Dwight K. Curtis; Dr. R. Lee Hornbake, University of Maryland, College Park, Md.; Dr. Louis V. Newkirk, board of education, Chicago, Ill.; Roy A. Radtke, board of education, Milwaukee, Wis.; Dr. Harold Silvius, Wayne University, Detroit, Mich.; G. R. Sutherland; and J. Ely Van Hart, board of education, Elizabeth, N. J., presented their views on the implementation of the new industrial-arts curriculum, which had been presented at the previous session.

"One-Man and/or Rural High School Programs," was the subject chosen for the sixth session which was under the chairmanship of Paul E. Harrison, immediate past president of the association, DeKalb, Ill.

The extent of one-man programs, the installation and organization, as well as the organization and administrative problems of the county program were presented by George C. Beery, Franklin County superintendent of schools, Columbus, Ohio; Fred C. Finsterbach, New York State College for Teachers at Buffalo, Buffalo, N. Y.; Lewis B. Miller, high school, Napoleon, Ohio; Dewey F. Barich, chairman, department of industrial-arts education, State University, Kent, Ohio; and Harold K. Anderson, president, New England Industrial Arts Association, Cranston, R. I.

The Epsilon Pi Tau initiation was held at 5 o'clock, Friday afternoon. This was followed by the Epsilon Pi Tau fellowship banquet at which Orville E. Sink presided.

The main speaker on this occasion was H. Jack Post, managing director, National Association of Foremen, Dayton, Ohio, who spoke on "Industry's Challenge to American Education."

He pointed out that our present industrial system has given untold advantages to the worker who really wants to work. He also remarked that our top management has come out of the rank and file of our workers. Then he developed what it takes to be a good foreman, or supervisor, or manager.

William D. Boutwell, co-ordinator, scholastic awards and director of the fair, scholastic magazines, New York City, spoke on "The National Industrial Arts Fair in Chicago."

Harold G. Palmer, State Teachers College, Cedar Falls, Iowa, presided at the Saturday morning session at which Louis V. Newkirk, R. L. Hornbake, O. A. Hankammer, Claude E. Nihart, DeWitt Hunt, and John J. Hatch presented "Statement of Position of the American Industrial Arts Association."

Clayton D. Hutchins, representative of the National Education Association, Washington, D. C., summarized this session.

At the business meeting the election of officers for the coming year was held. They are: president, John A. Whitesel; vice-president, Walter R. Williams, Jr.; secretary-treasurer, D. Arthur Bricker; vice-president in charge of safety, DeWitt Hunt; and vice-president in charge of teacher education, Otto A. Hankammer.

The next annual meeting will be held at Washington, D. C., during the first week in May.

Chester L. Messmore, Scranton, Pa., was in charge of the Ship's party at which the commercial exhibitors distributed the usual Ship's prizes.

### ILLINOIS VOCATIONAL ASSOCIATION CONVENTION

The annual convention of the Illinois Vocational Association was held on April 10, 11, and 12, 1947, at Peoria, Ill.

Considering the fine attendance, and the commercial and school exhibits, gave the visitor the feeling that the I.V.A. convention was back on the prewar level.

At the general session on Friday morning, Ernest J. Simon, president of the association, was chair-

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man. The two speakers, Vernon L. Nickell, superintendent of public instruction, state of Illinois, and L. H. Dennis, executive secretary, American Vocational Association, presented a very fine picture of "The Place of Vocational Education in Education," and "New Opportunities for Vocational Education."

At the annual banquet Dr. Lewis A. Wilson, deputy commissioner of education, Department of Education, New York, showed what New York and other states are doing for those students who are not going to college, and outlined how well vocational education fitted into this picture.

Edward M. Claude, state supervisor, trade and industrial education, Springfield, Ill., presided at the annual conference of trade and industrial education, at which current problems of evening school, in-service teacher training, and program planning were discussed.

Dale Roberts, supervisor of industrial-arts education, Springfield, Ill., and vice-president of I.I.E.A. for industrial arts, was chairman of the Industrial Arts Education general meeting on Friday morning. The speaker on this occasion was Dr. Homer J. Smith, head of industrial education, University of Minnesota, Minneapolis, Minn., who addressed the meeting on "The Outlook for Industrial Arts." He stressed the point that teachers should strive to upgrade their teaching by getting into the kind of job in which they could be happiest, and that the next three years would offer the best opportunities for making this change.

Martin Brauns, Jr., director, Washburne Trade School, Chicago, Ill., and vice-president of I.I.E.A. for Trade and Industrial Education, presided at the general meeting on Friday morning for the Trade and Industrial Education group.

The speaker was Thomas Diamond, professor of vocational education, University of Michigan, Ann Arbor, Mich., who presented the subject, "Industrial Education and Its Relation to General Education."

The industrial arts education section meetings were all well attended. The building trades group, for instance, held one at which Delbert L. Young, building trades instructor, Decatur High School, Chicago; and Mark Enfield, secretary, Illinois Conference of Operative Plasterers and Cement Finishers Association of America, spoke on the following subjects: "A Secondary School Building Trades Program," and "The Itinerant Teacher."

Walter E. Durbahn, chairman of vocational education, high school, Highland Park, was the chairman of this particular session.

The practical shop demonstrations on Saturday morning constituted a new innovation, an excellent idea, well attended and spoken of very highly. Two demonstrations were held in each division so a man could attend two complete demonstrations. Orville Connet, who attended a two weeks' demonstration class in New York last summer, gave an excellent demonstration of what really can be done in this important field, visual education.

At the business session the following officers were elected for the Illinois Industrial Education Association: president, Martin Brauns; secretary, Dr. Louis V. Newkirk; treasurer, Orville Connet; vice-president of trade and industrial education, John J. Duggan, vocational supervisor, Chicago; vice-president of industrial arts, Dr. Walter Klem, Charleston teacher; vice-president of guidance, Lester Schloerb, director of guidance, Chicago. The two new directors are Ernest Simon, state director, and Wiley P. Klingensmith, Chicago.

R. H. Simpson, Manual Arts Press, Peoria, was the captain who presided when the Ship program was put on.

### INDUSTRIAL EDUCATION SPRING CONFERENCE

A spring conference on industrial education, the first of its kind ever held in the state of Louisiana, convened on the campus of Northwestern State College, Natchitoches, La., April 18 and 19.

Leaders in the field of industrial education who appeared on the program were: Dr. H. H. London, head, department of industrial education, University of Missouri; Dr. Claude Ewing, supervisor of curriculum, Chicago Public Schools; E. L. Williams, vice-president of American Vocational Association, and director of industrial education extension, Texas A. & M. College; Dr. Andrew Triche, state supervisor, trade and industrial education, Baton Rouge; H. O. Thomas, assistant state supervisor, industrial arts education; John Pearce, specialist in industrial arts, New Orleans Public Schools; Giles Martin, director of Delgado Trade School, New Orleans; and Miss Violet O'Reilly, principal, L. E. Rabouin Vocational High School, New Orleans.

Dr. Leo T. Allbritten, a member of Northwestern State College Education Department, addressed the first general session on "The Place of Industrial Education in the School Curriculum." He emphasized the necessity of offering exploratory courses in industrial arts at the junior high school level for the purpose of assisting students to find themselves vocationally. He would also continue vocational training and the development of occupational skills through the junior college level.

E. L. Williams, addressing a general session, pointed out how the whole program of industrial education contributed as an integral part to our American education. Addressing a sectional meeting, Mr. Williams stressed the importance of community planning to meet vocational needs. Much discussion centered around purpose and function of occupational surveys.

Dr. H. H. London addressed a general session and a sectional meeting on industrial-arts education. At the general session, he discussed the part the schools can play through their industrial-education program in helping to industrialize the south.

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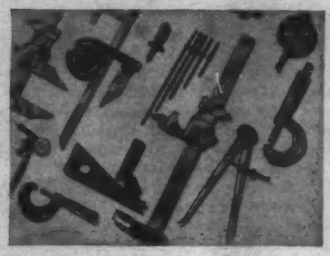

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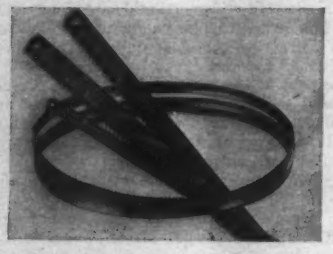

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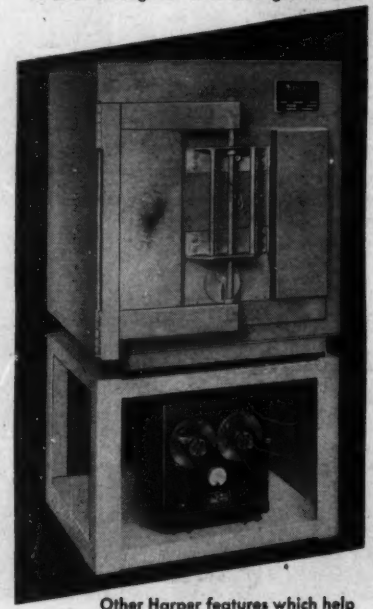

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natural resources and labor and that the south has more of both than any other section," he urged that the schools take the lead in industrializing the south. This can be done he continued, "Through an expanded program in the schools to develop technically trained workers for industry and a larger supply of teachers for the schools."

Dr. Claude Ewing showed how general education can be made more practical through industrial education. "In consideration of the best possible situation which will present the most fertile opportunity for youth to learn to think there is perhaps general agreement that the more natural the situation the more stimulation toward productive activity. Where can you find a better place for the fulfillment of these more natural situations than in a school shop that has been organized with thought given to the presentation of such an opportunity to youth."

In one of the sectional meetings, Dr. Ewing stressed the importance of correctly developing instructional materials. He pointed out three distinct steps in this procedure: (1) determine what is needed for instructional purposes, (2) segregate that which can be taught in the schools, (3) start instructing the class on some phase of the work to be covered.

It is the plan of the industrial-education people of Louisiana to make the spring conference an annual affair. The group accepted an invitation from Southwestern Louisiana Institute, Lafayette, for next year's meeting.

The conference was planned by a committee consisting of the following: Walter J. Robinson, head of department of industrial education, Northwestern State College; H. O. Thomas, assistant state supervisor, industrial arts education; and the following trade school directors: T. E. Hampton, Natchitoches; J. W. Moore, Shreveport; Jerome Bowling, Baton Rouge; and J. W. Mitchell, Crowley.

### INDIANA INDUSTRIAL EDUCATION ASSOCIATION CONVENTION

The fifteenth annual convention of the Indiana Industrial Education Association was held at Turkey Run State Park on April 18 and 19. The directors of vocational education met on Thursday preceding the convention at the call of H. G. McComb, state director of trade and industrial education. The day was given over to a discussion of the veterans' training program and questions and answers on the distribution of surplus property. John Brickner gave a very interesting discussion on "Methods of Promotion and Teaching in the Distributive Education Program." A panel discussion was conducted on the problem of the organization of trade clubs. This was led by Walter Tucker, co-ordinator at Marion. H. F. Brickley, director at Muncie, presented some interesting comments on a visual-aid program which he had attended at Cleveland. Attention was directed to many of the possibilities in this field in addition to the audio-visual aids.

The speaker at the first general session, which was the annual banquet, was Dr. F. B. Knight, director of the Division of Education and Applied Psychology at Purdue. He gave a very illuminating address on the causes of accidents, giving attention to the more subtle psychological factors which are generally overlooked as a cause of many accidents. Other speakers in the general sessions were H. G. Schonbert of the Linde Air Products, Indianapolis, who spoke on the subject of "Industry Challenges Youth." Staley Berrman, director at Evansville responded with a discussion on "How the Vocational Education Program May Best Serve Industry." At the final session, Dr. John R. Emens, president. Ball State Teachers College, Muncie, presented "Some Educational Contradictions." The speaker was presented by Fred Schmidt, Jr., who has recently been appointed to head the Department of Industrial Arts at Ball State Teachers College.

During the final session, the commercial exhibitors presented the prizes under the able direction of Mr. Kennedy of South Bend Lathe Works, assisted by John Claude of The Bruce Publishing Company, and others. According to the usual pattern, many worth-while prizes were given and much fun developed at the expense of many of the recipients.

The special programs included an array of talent and topics intended to present up-to-date material in many fields of industrial development. In one of the section meetings, an address and demonstration was given on "Plexiglas in the School Shop" by M. L. Brummer of the Rohm and Haas Company of Chicago. There was paralleling this a presentation of the topics of "Micro-wave Reflection" and "Radar and Sonar" by H. R. Gruelle of the Bell Telephone Company in Indianapolis. H. J. Willis of the Jefferson High School, Lafayette, Ind., gave his experiences on "Airplane Mechanics for the Small Shop," while H. J. Stewart of Arsenal Technical Schools, Indianapolis, presented the subject of "Silk Screen as a Medium in the Graphic Arts Shop."

While the sectional meetings were in progress, a ladies program had been arranged, at which time, Miss Eleanor Braid of the Smith-Alsop Paint and Varnish Company, Terre Haute, gave an address on "Colored Dynamics in the Home."

Iota Lambda Sigma held its initiation on Thursday evening at which time 18 candidates from Purdue University and men about the state were taken into the organization. A very able initiation ceremony was conducted by Harold Porter of Purdue University. On Saturday morning the organization joined the Epsilon Pi Tau at a breakfast meeting at which time Dr. B. L. Dodds, Purdue University, gave an interesting summary of the "Attitudes of School Administrators With Regard to the Program of Industrial Education in the Secondary Schools."

At the annual business meeting, Joseph R. Shafer of South Bend was advanced from vice-president to president, succeeding Alfred P. Smith of Indianapolis. William C. Baker, director at Columbus, Ind., was elected vice-president for the ensuing year.

This was the first attempt to hold the meeting at one of Indiana's well-known state parks. The accommodations by the Turkey Run Inn were exceptionally good. Approximately 400 persons were in attendance. Much of the credit for the success of the meeting should go to Alfred P. Smith, president; G. O. Johnson, in charge of exhibits; and C. Huston Isaacs, Terre Haute, who was in charge of local arrangements. H. G. McComb continues as secretary-treasurer of the organization.

### ANNUAL SPRING MEETING OF MISSOURI TEACHERS

"A Comprehensive Program of Industrial Education for Missouri," was the theme for the annual spring conference for Missouri teachers and supervisors of industrial arts and trade and industrial education. This conference, which is sponsored jointly by the Department of Industrial Education of the University of Missouri and the Trade and Industrial Section of the Missouri State Department of Education, was held on the campus of the University of Missouri, at Columbia, Friday and Saturday, April 4 and 5.

Tracy Dale, newly appointed assistant commissioner for vocational education in Missouri, presided at the opening meeting of the conference on Friday at ten o'clock. This meeting was devoted to the subject, "Administrative Problems in Industrial Education for Veterans." In discussing this subject, T. C. Adams, director of on-the-job training, Branch 9, Veterans Administration, St. Louis, presented major problems from the standpoint of the Veterans Administration. George E. Kohrman, director of industrial education, and James M. Wallace, director of veterans' education, both of the Missouri State Department of Education, Jefferson City, discussed the problems of administering the programs of industrial education for veterans on the state level.

(Continued on page 19A)

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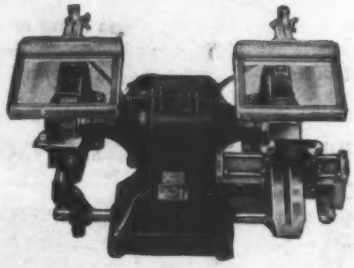

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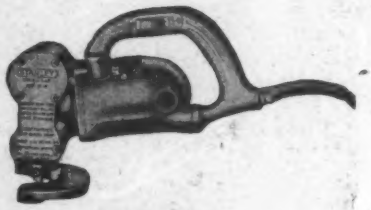

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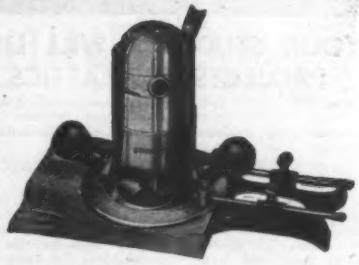

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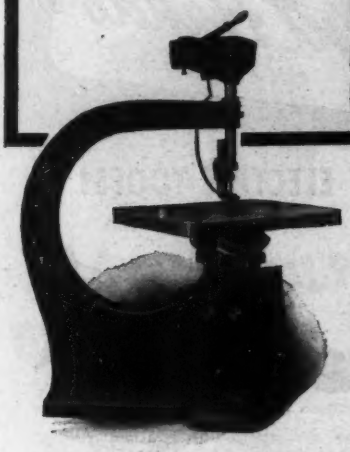
Smooth running



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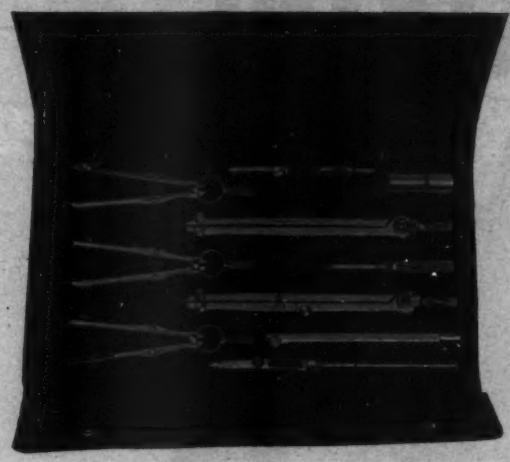

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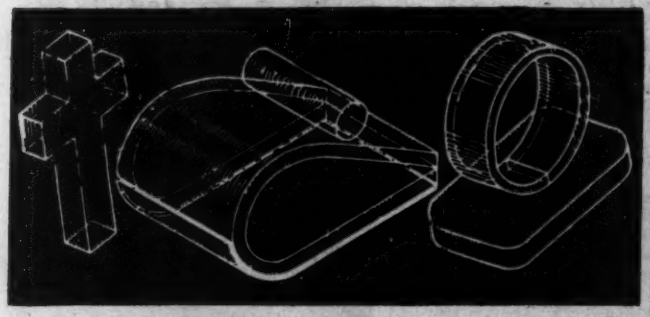

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(Continued from page 16A)

F. J. Jeffrey, principal, Hadley Technical High School, St. Louis, Mo., presided during the second half of the first general session. In discussing the subject, "Industrial Education and its Relation to Industry," Elmore N. Putney, vice-president, Ralston Purina Company, St. Louis, and president of the St. Louis board of education, presented management's viewpoint toward this problem. Labor's conception of the relation of industrial education to industry was presented by Don Murphy, supervisor, Apprentice-Training Service, Kansas City, Mo.

N. B. Grinstead, professor of industrial arts, Central Missouri State College, Warrensburg, Mo., presided at the industrial-arts sectional meeting on Friday afternoon, April 4. The subject, "Problems in Establishing an Industrial-Arts Program," was discussed by a panel which was composed of A. L. Crow, Leonard Steger, and H. Byron Masterson, superintendents of schools at Jefferson City, Webster Groves, and Kennett, Mo., respectively, and Albert Best and Leo Scott, industrial-arts instructors at Fredericktown and Windsor, Mo., respectively.

At the vocational-industrial education sectional meeting on Friday afternoon, Clarence Wetzel, industrial teacher-trainer, St. Louis, presided. George E. Kohrman presented the major provisions of the trade and industrial section of the new State Plan for Vocational Education. The members of the panel who discussed the applications of the new State Plan on the local level were: R. W. Baker, director of vocational education, Joplin; Harry Coxen, industrial teacher-trainer, Kansas City; Hollis W. Dahlor, co-ordinator, Kansas City; Ed C. Ralston, principal, Lead Belt Trade School, Bonne Terre; Raymond J. Sacks, welding instructor, Hadley Technical High School, St. Louis; and Ewell S. Thurman, co-ordinator, Marshall, Mo.

O. H. Day, director, vocational education, Kansas City, Mo., and president of the Missouri Industrial Education Association, presided at the general session, Friday at 7:30 p.m. Mr. Day introduced Dr. L. G. Townsend, dean of the School of Education, University of Missouri, who extended to the group greetings from the University. Tracy Dale discussed "The State Program of Vocational Education." The meeting closed after a discussion of "Industrial Education in the Over-All Educational Program," by John L. Bracken, superintendent of schools, Clayton, Mo.

Forest Whitworth, instructor of industrial arts, Maplewood-Richmond Heights High School, Maplewood, Mo., presided at the industrial-arts sectional meeting on Saturday morning. At this meeting Doyle Kemper, state supervisor of industrial arts, discussed "Our State Program of Industrial Arts as Viewed by the State Supervisor." Demonstrations in the use of plastics in the school shop were given by Dr. J. W. Richardson, Rohm and Haas Company, St. Louis. "Shop Organization and Management" was the subject for the Day Trade sectional meeting. M. Reed Bass, director, David Ranken Junior School of Mechanical Trades, St. Louis, presided. The speakers were as follows: Albert Carbot, acting director, industrial education, Springfield; Albert Jordan, assistant principal, Hadley Technical High School, St. Louis; M. Ray Karnes, assistant professor of industrial education, University of Missouri; and T. J. Singleton, instructor of auto mechanics, Moberly Junior College, Moberly, Mo.

A special day trade sectional meeting for machine-shop instructors was conducted by Walter C. Brown, Missouri state supervisor of industrial education. "Instructional Materials for Use in Machine Shop" was discussed by the following: Carl Walther, machine-shop instructor, Hadley Technical High School, St. Louis; Floyd Warner, machine shop and drafting instructor, St. Louis County Vocational School, Wellston; and Merton C. Wheeler, metal-shop instructor, Westpoint High School, Kansas City, Mo.

Arnold Embree, co-ordinator, Central High School, St. Joseph, Mo., presided at the co-ordinators' sectional meeting on Saturday morning. "Implications of Vocational Guidance for the Co-ordinator" was the subject for the panel discussion. The panel was composed of the following: H. W. Lancaster, co-ordinator, Manual High and Vocational School, Kansas City; E. H. Rohlfs, co-ordinator, Normandy; Glen Smith, director, guidance service, State Department of Education, Jefferson City; and Glenn Whitney, co-ordinator, Lexington, Mo.

One of the high lights of the conference was the luncheon meeting held at 12:15 Saturday, April 5, in the banquet room of the Daniel Boone Hotel. Dr. H. H. London, chairman of the department of industrial education, University of Missouri, presided at this meeting. Miss Bernita Bricker, student of music at the University of Missouri, entertained the group with several vocal selections. After the introduction of guests, Dr. London introduced the Hon. Hubert Wheeler, newly appointed State Commissioner of Education for Missouri, who discussed "The Place of Industrial Education in a Well-Balanced Program of Education."

♦ The Beta Chapter of Epsilon Pi Tau of Ball State Teachers College, Muncie, Ind., held a formal initiation and banquet February 8, 1947. A short talk was given at the banquet by President Emens of Ball State. The main speaker of the evening was Dr. W. E. Warner of Ohio State University, who gave an address on "Collegiate Honor Idea Here and Abroad."

Orville E. Sink, head, industrial-arts department, presented keys to Robert Brandon, Waymond Ferguson, Franklin Fitch, Cyril Hall, Homer Morris, Clarence Murray, William Peden, Kenneth Poucher, Robert Rhoda, Edward Sell, Dale Sipe, Robert Thomas, and Robert Wray.

(Continued on next page)

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**Precision lathes**

***Accuracy, Capacity and Safety***

**Because this is an age of precision machining of ever closer tolerances, any practical course in machine shop should stress and demonstrate accuracy. Among lathes that can come within the average school budget, the Sheldon TRBU-S56 is outstanding. Here is a moderate priced lathe with accuracy features of the largest and most costly lathes. "Zero Precision" Taper Roller Bearings, one of the finest bearings obtainable, permits this lathe to work to the very closest tolerances over a full range of speeds. A true industrial tool room lathe, TRBU-S56 has industrial capacity—11¼" swing, 1" collet capacity and standard industrial features and controls.**

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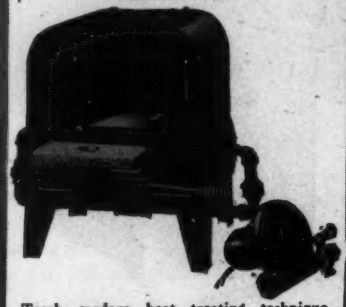

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(Continued from previous page)

Visiting chapters at the banquet were Alpha chapter of Ohio State University and Gamma chapter of Miami University. The officers of the Beta chapter are Homer Carl, Jr., president; Charles Pearson, vice-president; and Waymond Ferguson, secretary and treasurer.

♦ The Mechanical Drawing Association of New England held its spring meeting at Northeastern University, Boston, Mass., on April 12, 1947.

Dr. Alfred D. Simpson, Harvard University, School of Education, and director of recent surveys and advocate of higher salaries for teachers, spoke on "The Burning Question — Your Salary."

Dr. Nils Y. Wessell, dean of men, Tufts College, School of Liberal Arts, presented his topic, "What We Have Learned From the Veteran." — *William Bettencourt*, president.

## News Notes

♦ Tentative plans are being made by the Industrial Education Division of the State Department of Education and the University of Missouri for a one-week workshop for vocational trade shop instructors and co-ordinators beginning August 25, 1947. The conference will be held on the campus of the University of Missouri, Columbia, Mo. Sectional meetings will be held for co-ordinators and instructors of machine shop, auto mechanics, woodworking, carpentry, and welding, etc. Smith-Hughes teacher-training credit may be secured for attendance.

♦ The Case School of Applied Science, Cleveland, Ohio, has developed a slide-rule type of calculator for quickly determining the yield strength of aluminum alloys, brass, copper, carbon, and low-alloy steels. The calculator may be obtained from the Aluminum Research Institute, 111 West Washington, Chicago 2, Ill., at an approximate cost of $1.

♦ The fourth of a series of welding schools for farmers and club boys of the Houston, Tex., area, was conducted at the Waller High School recently. The series has been planned by the extension department of Texas A. & M. College, with equipment for the demonstrations furnished by the Big Three Welding Equipment Co., Inc., of Houston. The classes ran for four days, for farmers of Waller and Harris counties.

Schools have been held at Katy, Tomball, and Klein.

♦ A 17-week course in farm machinery repairs is being conducted by the agriculture department of the King George Training School at Edgehill, Va. G. T. Saunders is instructor of vocational agriculture at the school.

♦ Home-economics students in the applied art class at Cornell University, Ithaca, N. Y., have been studying simple bookbinding.

♦ The War Assets Administration, Washington, D. C., recently offered millions of dollars of surplus machine tools to schools at cut-rate prices for use in vocational training courses. They are offered at 5 per cent of "fair value."

♦ Applications for fifty all-expense General Electric Science Fellowships at Case School of Applied Science, Cleveland, Ohio, have been sent to all high school and preparatory school teachers of physics in nine central and midwestern states. The fellowships established by the General Electric Company will enable teachers to review recent developments in physics in a six-week summer program at Case from June 23 to August 1, 1947.

Dean Elmer Hutchisson, director of the program, announced that the following members of the scientific staff of the General Electric Company will assist the Case faculty in the program: Dr. E. E. Charlton, Dr. Saul Dushman, and Dr. K. H. Kingdon, all of the research laboratory of the General Electric Company in Schenectady, and Dr. C. G. Found, Dr. H. C. Froelich, Dr. Ward Harrison, Dr. Matthew Luckiesh, and H. H. Magdsick, all of the scientific staff of the General Electric Company at Nela Park, Cleveland.

Because of the wide interest in the program among teachers of physics, all applications for the General Electric Science Fellowships must be sent in by April 15. Teachers from the following states are eligible: Ohio, Michigan, Western Pennsylvania, West Virginia, Kentucky, Indiana, Illinois, Wisconsin and Maryland.

♦ The General Electric Company's Electronics Department at Syracuse, N. Y., plans to provide colleges throughout the country with small low-powered FM broadcast transmitters at less than a quarter the cost of previous equipment.

The establishment of such stations on a wide scale would encourage adult as well as student educational programs and at the same time help train thousands of students to meet the demand developing for commercial FM station personnel.

The G-E FM station plan calls for use of a small transmitter with a power output of two and a half watts. This would so reduce the cost that many schools could avail themselves of the educational FM broadcasting channels.

Approximately 400 schools in the nation have radio workshops, yet less than 10 per cent of them have stations in operation. At present only six colleges are using the 20 FM channels allocated by the FCC and only 22 permits to construct educational stations have been granted.

The diminutive FM transmitter proposed would provide a five- or six-mile range and could be received on standard FM receivers. This range is enough to cover most college campuses, fraternity, or sorority houses, and surrounding student homes with FM educational programs. The transmitter operates on about 250 watts.

## New Publications

**I Find My Vocation**

By Harry Dexter Kitson. Cloth, 278 pp., 5¾ by 8⅛ in., illus., $1.80. McGraw-Hill Book Co. Inc., New York and London.

This third edition is a complete revision of the above book. It embodies the latest U. S. census information, contains two new chapters on social security and unemployment compensation, and the list of occupations has been revised to conform to the *Dictionary of Occupational Titles*.

The 23 chapters into which the book is divided provide the reader with an excellent road map for his journey of exploration through the world of work.

**Workshop Calculations, Tables and Formulas**

By F. J. Camm. Cloth, 144 pp., 5⅝ by 8¾ in., illus., $2. Chemical Publishing Co., Inc., Brooklyn, N. Y.

A handy manual for the student and the mechanic. It contains useful information and formulas for mensuration, trigonometry, extracting square and cube roots, continued fraction, arithmetical and geometrical progression, and also shows how this information and the formulas may be applied for solving problems in physics and mechanics and for determining sizes of springs, gears, keys, and similar technical problems.

The book also contains a number of important mathematical and reference tables.

**Training High-School Youth for Employment**

By E. C. Rakestraw. Cloth, 217 pp., 5⅝ by 8½ in., illus. $3.50. American Technical Society, Chicago, Ill.

A comprehensive, expository treatise showing how those high school students who are not preparing to enter college, may be helped to prepare for entrance into numerous trades and occupations by establishing a co-operative part-time diversified occupations program.

(Continued on page 26A)

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**IF YOU ARE WORKING THIS SUMMER** you may find consolation in the fact that we too are working — turning out books at our maximum rate in order that you may not experience delays in delivery next fall. June to September is just like the rest of the year to us, with the production, research, and service facilities of A.T.S. and TECH TRAINING working at full capacity to provide the finest materials and the best possible service to vocational training — the field which has so completely fulfilled our expectations of almost fifty years ago when we published our first vocational book.

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By Townsend

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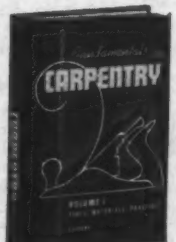


### Fundamentals of Carpentry
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Vol. II — Practical Construction.
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4. How to Estimate for the Building Trades. Price, $5.50.
5. Building Insulation. Price, $4.50.
6. How to Plan a House. Price, $5.00.
7. Stair Building. Price, $2.50.
8. Carpentry Student Study Guide. Price, $1.20.

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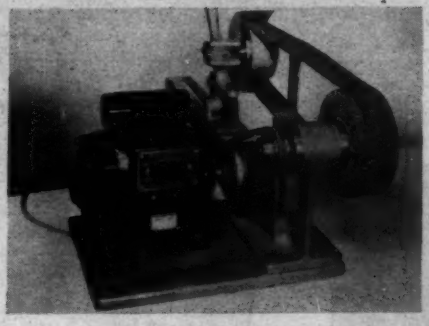
# Shop Equipment News

## NEW PRODUCTS — PUBLICATIONS

### NEW UTILITY GRINDER

The abrasive belt has now been applied to a new utility grinder by Porter-Cable Machine Company of Syracuse, N. Y.

This new machine provides the advantages of grinding on an abrasive belt operating over a resilient contact roll or wheel in a popular priced unit. Since the wear is on the abrasive belt and not on the supporting contact wheel, this wheel



New utility grinder

or roll remains flat, square at the corner or side, and maintains its diameter and balance. The resiliency of the roll eliminates chatter. Even an inexperienced person can grind smoothly on this balanced roll.

For grinding and polishing of certain rounded or oval parts, such as scissor handles, an additional formed resilient contact roll can be attached to the grinder in place of the platen.

Work may also be done on the free or unsupported abrasive belt. The grinder may be set up either in the horizontal or in the vertical position.

**For brief reference use IAVE—0601.**

### "ZERO PRECISION" ADDED TO SHELDON LATHES

The Sheldon Machine Co. Inc., 4258 N. Knox Ave., Chicago 41, Ill., manufacturers of precision lathes, milling machines, and shapers, announce an addition to their "S-56" series of lathes.

The new S-56, the TRB S-56, employs for the first time in a moderate priced lathe "Zero Precision" tapered roller bearings. To accommodate the large zero inspection bearings, the headstock has been redesigned, eliminating bearing caps and changing to a larger and solid housing. So equipped, this 11¼-in. swing, 1-in. collet capacity (1⅜-in. hole through spindle) lathe has real built-in accuracy.

New Sheldon "Zero Precision" lathe

It comes mounted on a heavy, well-ribbed metal cabinet that houses a 4-speed V-belt underneath drive, with double V belts to spindle. The bed is 56 in. long and has 35 in. between centers. The TRB S-56 is now in production and is being widely displayed by machinery distributors.

**For brief reference use IAVE—0602.**

### NEW STANLEY ELECTRIC TOOL BUILDING

Stanley Electric Tools, Division of The Stanley Works, recently moved into its new, modern six-story building at 480 Myrtle Street, New Britain, Conn.

Stanley's new six-story building at New Britain, Conn.

The new building provides additional space for manufacturing and assembling the portable electric tools in the Stanley Electric Tool and Stanley-Carter lines. General offices of the company are located on the street floor of the new building.

### NEW MEMBERS ADMITTED TO ATKINS PIONEERS

Atkins Pioneer Club held its 41st annual banquet Saturday night, March 15, at the Roof Garden of the Severin Hotel, Indianapolis, Ind., at which time full recognition of the long service to the company was given to the ten new members.

Arch N. Bobbitt, corporation council of E. C. Atkins and Co., addressed the 450 members present on future planning of Indianapolis, and

(Continued on page 24A)

Reading from left to right: Martin Mihalyi, Leslie Cooper, Clarence Wallace, Isaac Price, Henry Masters, Ormel Sauers, Herman Burkhart, Stobert Marsh, and Elias C. Atkins, president of E. C. Atkins and Company. Other new members not shown are: Charles Oberling, Jr., Phonso Coffey, and George Hunter

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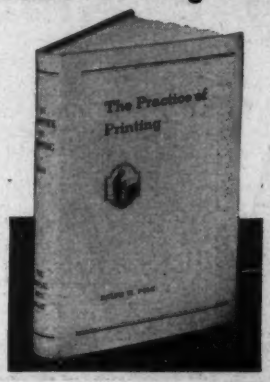


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(Continued from page 22A)

the part the Pioneer Club will have in the picture.

The ten new members also received their 20-year service pins.

### LASZLO UNIVERSAL HAND PRESS

The Laszlo Universal Hand Press, an all-round printing press manufactured and sold by the Rembrandt Graphic Arts Co. Inc., 165 East 60th St., New York 22, N. Y., fully meets the requirements for making color prints because it keeps the blocks (one for each color) and paper in perfect register during the printing operation.

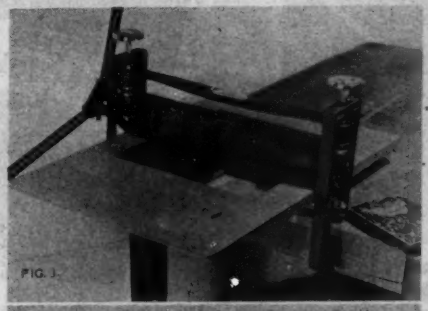
FIG. 1.

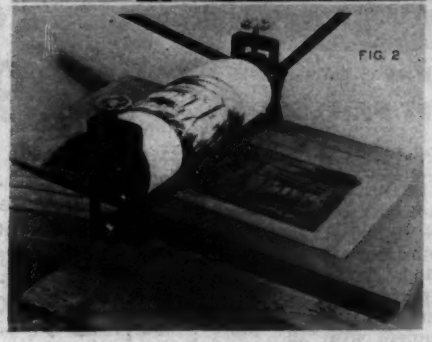
FIG. 2

Color printing with the Universal hand press

To cut the registered blocks, cut the first one (called the *master* or *key* plate) so that it contains all details of the design. Ink up this key plate with black ink and place it in the corner of the printing chase. Then rotate the machine to print the design on the rubber roller. Next, place an identical size blank block in the same corner of the machine, and offset the image from the roller onto the block. Follow the same procedure in making as many duplicate blocks as are needed. See Figure 1.

When doing the printing, leave the paper in the press between the roller and the bed, while the different colors are printed on top of each other, by changing the blocks successively. The absorbent quality of the paper helps to prevent the smudging of the colors.

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The "Marquette Story" is of 33-min. duration and may be used with any 16mm. sound projector. It will be loaned free to dealers, schools, or interested groups upon request to Marquette Manufacturing Co. Inc., Minneapolis 14, Minn. — Dept. J-22.

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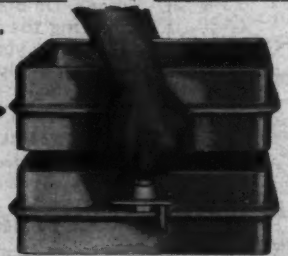

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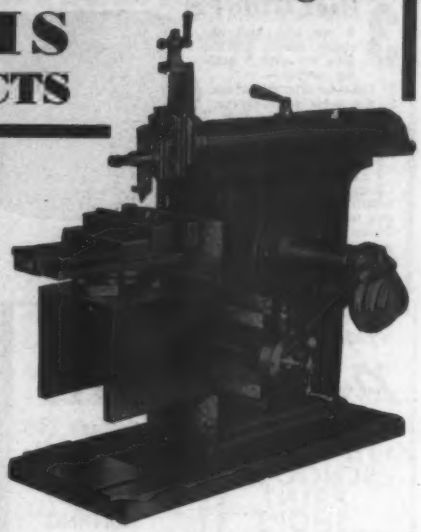

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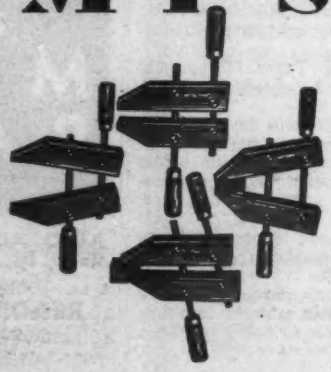

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(Continued from page 20A)

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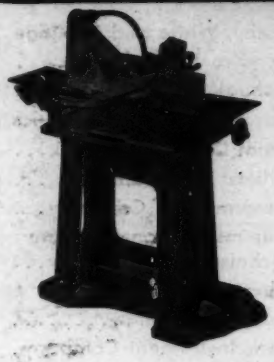

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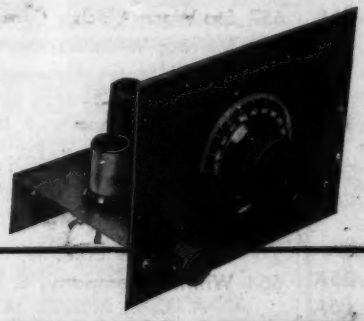

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